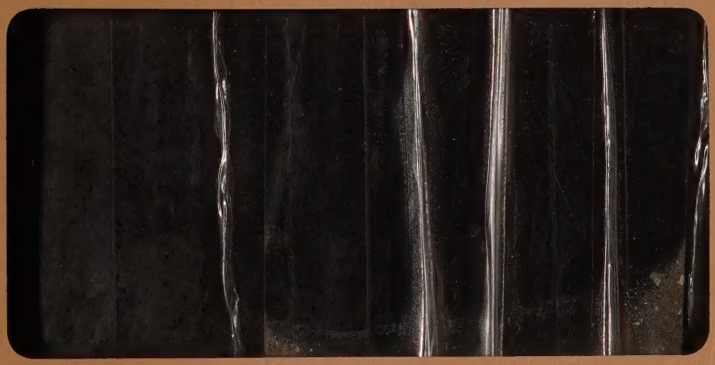
AUSTRON



AUSTRON INC. P.O. BOX 14766 - EXIT 248, N. IH 35, AUSTIN, TEXAS 78761 (512) 251-2341 TWX 910/874-1356

MODEL 8720
TIME CODE GENERATOR

OPERATION AND MAINTENANCE MANUAL
SERIAL NO. C001

NOVEMBER 1985

P/N 12708719

REVISION A

WARRANTY

AUSTRON, Inc. of Austin, Texas, warrants for one year after delivery to the original purchaser of any product manufactured by AUSTRON, that same shall be free of defects in material and workmanship. Obligation under this warranty shall be limited to repair or replacement, at AUSTRON's discretion, of any product or part thereof which has been returned by the original purchaser with transportation prepaid, and upon examination by AUSTRON, is found to be defective. AUSTRON assumes no responsibility for loss or damage to equipment being returned for repair or replacement under the terms of this warranty.

For this warranty to be effective, the purchaser agrees that the equipment will be properly installed and maintained. Equipment which, upon examination by AUSTRON, requires repair or replacement of parts thereof as a result of improper installation, misuse, unauthorized alterations or repairs, or user negligence, such repairs or replacement of parts thereof will be made at cost.

AUSTRON makes no representation or warranty of any kind, either expressed or implied, with respect to equipment operation and procedures. Any action that the user may take in reliance upon the operation or accuracy of this equipment shall be taken solely upon the user's own responsibility and risk.

AUSTRON shall not be liable for consequential damages to purchaser, user, or any others resulting from the possession or use of this equipment.

Prior to return of a product under terms of this warranty, AUSTRON, Inc., Austin, Texas, is to be notified. Notification is to include the model number and serial number of the product and full details of the problem.

MODEL 8720 TIME CODE GENERATOR

INTRODUCTION

This manual is for personnel operating or maintaining the Model 8720 Time Code Generator manufactured by AUSTRON, Inc. It contains information concerning the physical and electrical specifications, installation, adjustment and operational procedures, and theoretical descriptions. In addition, the manual provides parts lists, assembly drawings, schematics and block diagrams.

AMENDMENT NOTICE

AUSTRON, Inc. makes every attempt to provide up-to-date manuals with the associated equipment. Occasionally, changes are made to the equipment wherein it is necessary to provide amendments to the manual. If any amendments are provided for this manual they are printed on paper stock other than white and will be found at the rear of this manual.

NOTE

The content of any amendments may affect operation, maintenance or calibration of the equipment.

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1. GENERAL DESCRIPTION

1.1. SCOPE OF SECTION

Section One introduces the Model 8720 Time Code Generator. Provided here is the description of the equipment and a brief discussion of the unit's input/output signals as well as environment and power requirements.

1.2. PURPOSE OF EQUIPMENT

The Model 8720 is a precise digital clock which generates a serial time code. It is a highly flexible unit suitable for stationary or portable applications where real or elapsed time are maintained for control, recording or display.

1.3. MODEL VARIATIONS

A number of variations and extensions of the basic configuration are available as standard options. A list of these standard options is located in Section Six.

1.4. SPECIFICATIONS

The following paragraphs describe the Model 8720 specifications.

1.4.1. Display

The Model 8720 has a nine digit, seven segment, high efficiency LED display which indicates the time in days, hours, minutes and seconds. Numerals are 0.43 inches (11 mm) high and are red in color.

1.4.2. Time Base

The time base is a crystal controlled 1 MHz oscillator with an aging rate of better than one part in 10 to the seventh per day and an overall stability of $\pm$1 in 10 to the fifth from 0°C to 60°C.

1.4.3. Outputs

The following paragraphs describe the Model 8720 outputs.

1.4.3.1. Modulated Time Code

The modulated time code is output through a rear panel BNC. The signal is a modified IRIG B Time Code with BCD days through seconds on a 1 kHz carrier.

The amplitude is internally adjustable from 0.0 V to 5.0 Vp-p. Amplitude is normally set to 3.0 Vp-p.

The modulated ratio is internally adjustable from 2:1 to 6:1. The ratio is normally set to 3:1.

The output impedance is less than 20 ohms, current limited at 15 mA.

The Level Shift (DC) Code Output is located at rear panel connector, (J102, 47).

The DC Level Shift is a version of the modified IRIG B Time Code, DTL/TTL compatible.

ONE = 5.0 V $\pm$.5 Vdc @ 1.2 mA
ZERO = 0.0 V $\pm$.1 Vdc @ 3.2 mA sink

1.4.3.2. 1 PPS Signal

The 1 pps signal is output through panel connector (J102, 20).

1.4.3.3. Carrier Signal

The carrier signal is output through rear panel connector (J102,45). The square wave at the carrier frequency is DTL/TTL compatible.

1.4.4. Remote Control Inputs

The Remote Control Inputs are ground true TTL/DTL levels. Inputs are in parallel with front panel switches and should not be used unless REMote switch is operated (REM line to pin 25 of J102 low).

1.4.4.1. STOP

The STOP signal comes into rear panel connector (J102, 22). The signal is a ground pulse with a duration of one second or greater.

1.4.4.2. HOLD

The HOLD signal comes into rear panel connector (J102, 23). The signal is at ground level. The unit remains in HOLD as long as the input is held at ground level, ZERO.

1.4.4.3. RUN

The RUN signal comes into rear panel connector (J102, 24). The signal is a ground pulse with a duration of 1 us or greater.

1.4.4.4. RESET

The RESET signal comes into rear panel connector (J102, 48). RESET is a ground pulse with a duration of 10 ms or greater. The unit must be in the HOLD mode with time base running when the RESET pulse is sent.

1.4.5. Environmental Requirements

The unit operates normally from 0°C to 50°C in up to 95% relative humidity.

1.4.6. Power Requirements

The unit is set at the factory to operate at 115 Vac, 48 Hz to 440 Hz, with an internal jumper to change to 230 Vac, 48 Hz to 440 Hz.

The unit also operates on 12 Vdc $\pm$2 Vdc.

NOTE

If both ac and dc power are connected, the unit normally operates from the ac power. But if the ac is lost, the unit switches to the dc power automatically without interruption of operation.

1.4.7. Physical Requirements

Size

The unit is 1 3/4 inches high (4.44 cm) by 9 1/2 inches wide (24.1 cm) by 12 inches deep (30.5 cm).

Weight

The unit weighs less than 5.5 lbs (2.49 kg). (Add 3 lbs (1.36 kg) for internal battery.)

2. INSTALLATION

2.1. SCOPE OF SECTION

Section Two describes the steps required to prepare the Model 8720 for operation and reshipment to another location. Included in this section are instructions for unpacking, inspecting, installing and storing the unit.

2.2. UNPACKING AND INSPECTION

As soon as the instrument is received, verify that it is intact and as ordered. Inspect the instrument for any damage and if shipping damage is found, refer to the warranty in the front of this manual, and to Section 2.4 for general packaging instructions.

As soon as possible, the instrument should be installed and given a thorough electrical inspection to ensure compliance with the specifications cited in Section 1.4. Should the instrument fail to meet specifications, immediately contact your AUSTRON representative.

2.3. INSTALLING THE UNIT

The following paragraphs describe power requirements, installation and initial adjustments.

2.3.1. Power Hookup

The Model 8720, unless otherwise specified, is supplied to operate from 12 Vdc $\pm$2 Vdc or 115 Vac $\pm$10%, 48 Hz to 440 Hz. For instructions to adapt the Model 8720 for 230 Vac operation, refer to Dwg. No. 12307962-01, Sheet 2, Note 3.

2.3.1.1. Initial Adjustment

The Model 8720 is shipped in a fully operational condition and does not require any initial adjustment. The modulated (ac) output code is set at the factory to 3 Vp-p with a modulation ratio of 3:1. Internal adjustments are provided. If it is desired to change this output, refer to Section Four for the adjustment procedure.

2.4. STORAGE AND RESHIPMENT

Environmental conditions during storage and reshipment should be limited as follows:

Maximum Temperature: 185°F (85°C)

Minimum Temperature: -69°F (-55°C)

To protect your instrument during shipment or storage, use the best packaging methods available. Contract packing companies can provide dependable packaging on short notice.

General packaging instructions:

1. Wrap the instrument in heavy paper or plastic before placing it in the shipping container.

2. If possible, use the original container designed for the instrument. Otherwise, use a strong carton (350 lb per sq in bursting strength) or wooden box to house the instrument.

3. Use plenty of packaging material around all sides of the instrument and protect the front panel with cardboard strips.

4. Seal the package with strong tape or metal bands. Mark with "DELICATE INSTRUMENT".

5. Refer to the warranty in the front of this manual and check with your AUSTRON representative for shipping instructions.

In all correspondence refer to the instrument by model number and full serial number.

3. OPERATION

3.1. SCOPE OF SECTION

Section Three details controls and indicators which are clearly labeled for ease of operation. The Model 8720 is ready to operate as soon as the power is connected and the power switch is placed in the ON position.

3.2. CONTROLS AND INDICATORS

The following paragraphs describe the Model 8720 controls and indicators.

3.2.1. POWER Switch

The power switch is a locking toggle switch located at the lower left corner on the front panel. When this switch is in the OFF/CHG position, power is removed from the generator and display circuits but the battery charging circuity is energized. (If the internal battery option is included, the batteries are on charge when the power is connected to the unit.)

When the power switch is placed in the upward position it locks ON connecting power to generating and display circuits. The display lights with ZERO time (000:00:00:00). If the mode switch is in the RUN position, the display starts updating once per second.

If the unit has the internal battery option and the power switch is put in the ON position without ac or dc power connected, the display digits do not light. Only the colons light, indicating that all the generating circuits are energized. The display can only be read by pressing the display switch, (S7).

3.2.2. MODE Control

The mode control is a set of four interlocked push button switches. When one of these switches is pressed, it releases the previously pressed switch.

3.2.2.1. STOP Switch

Pressing the STOP switch arms the PRESET/RESET function and freezes the time accumulator. No serial outputs are generated. When operating from the RUN mode, the unit stops at the next update.

3.2.2.2. HOLD Switch

Pressing the HOLD switch arms the PRESET/RESET function and inhibits updating the time accumulator. The instrument continues to generate all serial outputs with the time frozen at the last update.

3.2.2.3. RUN Switch

Pressing the RUN switch inhibits the PRESET/RESET function and starts the unit keeping time beginning with the time appearing in the display.

3.2.2.4. REM Switch

Pressing the REM switch does not change the operating mode of the unit. REM supplies a ground level to output connector (J102, 25) that is used to remotely operate the unit via the remote inputs at (J102, 23) HOLD, (J102, 22) STOP and (J102,24) RUN.

NOTE

These inputs are connected in parallel with the mode switches. Use the mode switches only when the REM switch is operated.

3.2.3. PRESET/RESET Switches

The HOLD mode enables PRESET or RESET of the unit after it is in RUN (time base on). The PRESET/RESET switch is a momentary (up/down) toggle switch with center OFF position. RESET clears the entire TOY accumulator. PRESET loads the accumulator with the selected contents of the PRESET thumbwheel switches except when OFF is selected on the most significant switch, (S2). Seconds are loaded if "S" is selected, minutes if "M" is selected and hours if "H" is selected. Days are loaded if the most significant switch is set to 0, 1, 2 or 3.

3.3. OPERATION

The operation of the Model 8720 is easy using the following procedure.

1. Apply power, ac or dc.
2. Move the POWER switch to the ON position.
3. Press the RUN mode switch.
4. Press the HOLD mode switch.
5. PRESET the starting time in the accumulator.
6. At the preset time, press the RUN switch.

The unit is now operating and supplying time code to its output connectors.

4. MAINTENANCE AND CALIBRATION

4.1. SCOPE OF SECTION

Section Four covers recommended maintenance and repair test equipment and procedures for the Model 8720. Also included are instructions for calibration of the time code generator.

4.2. FACTORY SERVICE

When your Model 8720 requires service that cannot be accomplished on site, contact your AUSTRON representative. He can provide field service or arrange for factory returns, when necessary. Address all inquiries on operation or applications to your sales representative:

AUSTRON, Inc.
P. O. Box 14766
Austin, TX 78761

Specify both the model and complete serial number in all correspondence. If necessary, you may phone AUSTRON at (Area Code 512) 251-2341.

4.3. ROUTINE MAINTENANCE

AUSTRON recommends a regular program for maintenance and inspection every five-to-six months for this unit. As part of these regular procedures, check the instrument in the following manner.

1. Disconnect power and remove the cover.

2. Make a thorough visual inspection of all wiring and cables. Check for frayed, loose or burned wires.

3. Check the physical integrity of all components. Look for burned or cracked components, loose solder connections, leakage of insulation compounds and general physical damage. When a PCB contains integrated-circuit packages, ensure that all packages are firmly mounted. Never unnecessarily remove and replace a package.

4. Check all front panel switches and controls for loose or broken terminals, loose or sticking shafts, etc.

5. If the internal panel surfaces and components have an excessive amount of dust deposited on them, use a soft brush and low-pressure stream of air to remove the foreign material.

CAUTION

Do not clean the PCB or small internal components with a stiff brush or solvents, since damage to the circuits may result. Do not use a high-powered vacuum cleaner device on small internal components.

6. Wipe the external surfaces of the instrument with a soft damp cloth to remove dirt, fingerprints and other foreign materials.

7. Replace the cover and reconnect power. Perform the Operational Test and Calibration Procedure (Section 4.5). If performance does not match or exceed the specifications listed in Section One of this manual, corrective maintenance is in order.

4.4. PCB REPAIR RECOMMENDATIONS

When replacing integrated circuits (ICs) or other electronic components soldered to PCBs, follow the procedures listed below or damage to the PCB or other components may result.

1. Determine by troubleshooting techniques, which IC or discrete component(s) has failed.

2. Remove the defective component(s) from the board by cutting the pins or leads with a small diagonal clipping tool. (Always remove and replace the entire component.)

3. Apply heat (40-50 W soldering iron) sparingly to each of the cut pins or leads and remove from the PCB; clean the hole(s) with a toothpick or solder suction tool.

4. Form the tinned leads of the replacement part and insert in the printed circuit holes; solder, then trim leads to extend 1/16 inch beyond the back surface of the board. (Use only 63-67 solder with maximum 1/16 inch diameter.)

CAUTION

Only trim semiconductor leads after soldered installation is complete. This procedure greatly lessens the possibility of component failure due to shock-wave damage caused by the trimming tool.

5. When soldering semiconductor devices or any small component(s), be sure to use a heat sink tool or long-nosed plier connected to the component lead(s) while each is being soldered. Allow the soldered connection to cool before removing the heat sink.

6. Clean all dirt and solderflux from the printed circuit traces by liberal application of isopropyl alcohol or freon-type solvents.

4.5. OPERATIONAL TEST AND CALIBRATION PROCEDURE

In the event of an equipment malfunction, the following circuit descriptions and adjustment procedures, if followed in the listed sequence, will allow the technician to isolate the trouble to a particular PCB or subsection. When the trouble is isolated, the functional description in Section Five and option information in Section Six will facilitate repair.

4.5.1. Recommended Test Equipment

The following test equipment or equivalent in Table 4-1 is recommended for use in servicing the Model 8720.

Table. 4-1: Test Equipment for Model 8720.

Model	Manufacturer	Minimum Specifications
422	Tektronix, Inc.	Oscilloscope, 15 MHz bandwidth, triggered sweeps from 0.1 ms/cm to 5 s/cm, vertical sensitivity from 0.05 volts/cm to 20 volts/cm
6012	Tektronix, Inc.	Probe, 10:1 attenuation ratio, 17 pF capacitance
	Systron-Donner	DMM 10 Megohm input impedance, ±0.1 percent accuracy
6250	Systron-Donner	Frequency Counter, 0 Hz to 50 MHz, 3 parts/10 to the seventh per week
8730	AUSTRON, Inc.	Time Code Reader

4.5.2. Power Supply
(Dwg. No. 12307962-01, Sheet 2)

The Power Supply has two adjustments: The Float and Charge adjustments in the battery charging circuit. The FLOAT and CHARGE adjustments are made with the optional batteries disconnected, with ac or dc power connected to the unit and the power switch in the OFF/charge position.

4.5.2.1. Float Adjustment

1. Disconnect the batteries.

2. Connect a 10 kilohm 1/4 W resistor between the red and black test points located near the forward end of the transformer.

3. Monitor the voltage across the resistor (10 kilohm) with the DVM.

4. Adjust R5 for a reading of 9 Vdc $\pm$0.1 Vdc.

5. This completes the Float Adjustment.

4.5.2.2. Charge Adjustment

NOTE

Charge adjustment is unnecessary if the internal battery option is not supplied.

1. Disconnect the batteries.

2. Connect a 90 ohm 1 W resistor between the red and black test points.

3. Monitor the voltage across the resistor with the DVM.

4. Adjust R7 for a reading of 9.6 Vdc $\pm$0.1 Vdc.

5. This completes the Charge Adjustment.

4.5.3. Time Base Oscillator
(Dwg. No. 12307909-01)

The accuracy of the oscillator is determined, relative to a frequency standard, by observing the rate of shift of an oscilloscope connected as shown in Figure 4-1, Oscillator Accuracy Test.

If the pattern moves to the right, the frequency of the oscillator under test is higher than the frequency of the 1 MHz standard; if the pattern moves to the left, the frequency under test is too low.

To check oscillator frequency, perform the steps in the following procedure.

1. Connect the 1 MHz frequency standard to the external trigger input of the oscilloscope.

2. Connect the vertical input to the oscilloscope to the EXT 1 MHz input BNC on the rear panel of the Model 8720.

3. Set the oscilloscope sweep time to 0.1 us/cm and adjust the controls for a presentation of 1 cm to 2 cm vertical deflection.

NOTE

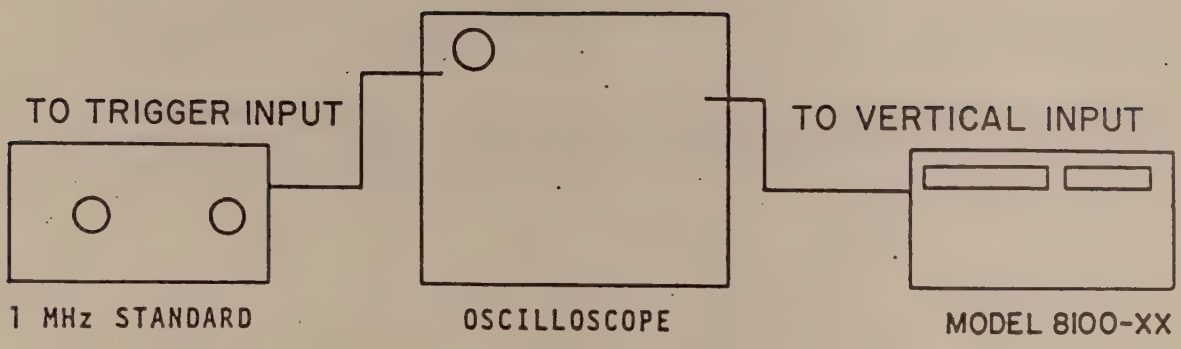
This is a low level signal of less than 0.1 Vdc.

4. Horizontal drift of the oscilloscope display in cm/sec is the difference from the standard frequency in parts/10 to the seventh. If necessary, adjust the oscillator varying C8, on Generator/Time Base PCB, A3, until drift is negligible.

Table. 4-2: Oscillator Accuracy Test.

Drift	Accuracy
1 cm/0.1 sec	1 part in 10 to the sixth
1 cm/sec	1 part in 10 to the seventh
1 cm/10 sec	1 part in 10 to the eighth

REVISIONS			
LTR	DESCRIPTION	DATE	APPD
—	RELEASED	4-16-85	OR
A	REVISED PER ECO 7613	7-24-85	OR



	8154
	8155
NEXT ASSY	USED ON
APPLICATION	

TOLERANCES
UNLESS OTHERWISE SPECIFIED

DEC	FRAC	ANG

MATERIAL:
Figure 4-1

ENGR	[signature]	4/16/85
CHECK	[signature]	4-16-85
DRAWN	[signature]	4/16/85

AUSTRON INC.
AUSTIN, TEXAS

BLOCK DIAGRAM-
OSCILLATOR ACCURACY TEST

SIZE	CODE IDENT NO.		REV
1	24672	12410260	A

SCALE NONE | SHEET 1 OF 1

4.5.4. Shaper/Modulator (Dwg. No. 12307909-01)

The Shaper/Modulator circuit, which develops the AC CODE Output, has three adjustments. These are the TUNE or phase control, the Modulation RATIO control and the Output AMPLITUDE control. All three controls are located on the generator PCB. Monitor the AC CODE at the unit rear panel (BNC J103) using the oscilloscope.

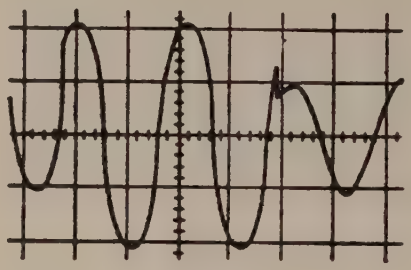
1. Adjust the TUNE potentiometer (R28) for maximum signal amplitude.

2. Adjust the AMPLITUDE potentiometer (R35) for nominal 3 Vp-p large cycles.

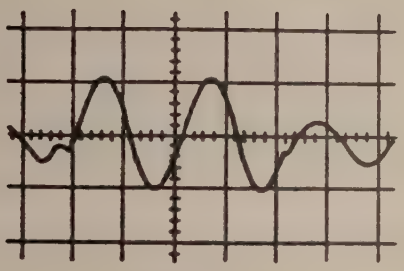
3. Adjust the RATIO potentiometer (R21) for a 3:1 modulation ratio.

4. Readjust the TUNE control until the junctions between large and small cycles have a minimum of distortion. (Refer to Figure 4-2, Tune Control Adjustment.)

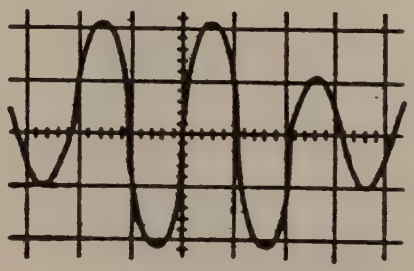
REVISIONS			
LTR	DESCRIPTION	DATE	APPD
	RELEASED	11/15/85	CRL



Incorrect
Adjust Tune Control CW



Incorrect
Adjust Tune Control CCW



Correct

		TOLERANCES UNLESS OTHERWISE SPECIFIED			AUSTRON INC. AUSTIN, TEXAS	
		DEC	FRAC	ANG		
		MATERIAL:			TUNE CONTROL ADJUSTMENT	
	8100	Q.A.			SIZE 1	CODE IDENT NO. 24672	12408760	REV —
NEXT ASSY	USED ON	ENGR						
		CHECK	[illegible]	11-15-85				
APPLICATION		DRAWN	P.J. [illegible]	11-15-85	SCALE NONE		SHEET 1 OF 1	

5. FUNCTIONAL DESCRIPTION

5.1. SCOPE OF SECTION

Section Five includes detailed explanations of the Model 8720 circuit functions, with assembly drawings, logic and schematic diagrams, and parts lists for each circuit of the basic unit.

The Model 8720 Time Code Generator is a digital clock which generates a serial (IRIG B) time code. The 1 MHz time base signal is divided down to 1 pps which is fed to the timekeeping circuits. All the timekeeping and the code formatting control is done by the microprocessor (U5) (Dwg. No. 12307962-01). The microprocessor controls the signals that are used in the generator section to generate the modulated time code. The microprocessor also feeds the time information to the display circuits so that the time is displayed.

The optional features mentioned are described in Section Six when included in the unit. The reference designators used in the Model 8720 are listed in Table 5-1.

Table. 5-1: Reference Designators.

Symbol	Component
A	Printed Circuit Board (PCB)
C	Capacitor
CR	Diode
DS	Lamp
FL or Z	Filter
F	Fuse
J	Jack
L	Inductor
P	Plug
Q	Transistor
R	Resistor
U	Integrated Circuit (IC)
UQ	Transistor Pack
UR	Resistor Pack
S	Switch
T	Transformer
TP	Test Point
W	Jumper
X	Socket

5.2. BASIC UNIT LOGIC
(Dwg. No. 12307918-01)

Schematic Dwg. No. 12307918-01 shows the three major assemblies of the Model 8720 interconnections and all indicators, controls and connectors.

PCB A1 contains the power supply circuits and the microprocessor unit (MPU) with its support circuitry. The MPU controls all the functions of the unit. The MPU also keeps the time, generates the time code format, and supplies the information to the display circuits.

PCB A2 contains the output circuits for the serial time code and the circuits for the 1 MHz time base. The MPU uses this time base to keep precise time. The serial output circuits include the shaper for generating the sine wave, the modulator, for modulating the sine wave, and the output amplifier.

PCB A3 contains the circuitry for decoding the BCD time from the MPU to seven-segment time for the displays and contains the circuits to drive the displays. A3 is also an interconnect between the front panel controls and the MPU PCB A1.

REV	DESCRIPTION	ENG APP.	ECO NO.	DATE	APP BY
C	DWG NO WAS 07191901		4837		
A1	J102-20 ADDRESS WAS "1 KPPS", IS NOW "1 PPS".	-	-	9/4/78	
B	CHG COIN TO "COIN" POSITION OF S7		11538	4/14/82	DAB
B1	CORRECTED MISC DRAFTING ERRORS			NFC 6/21/83	

L14 BATTERY OPTION

A17 COINCIDENCE OPTION

DAYS/ID 1 HOURS 1MINUTES 1SECONDS

A3-A1 DISPLAY ASSY 00307877-2 SCH 12307908-1

DISPLAY S7 · CLEAR S8 · COIN S6 · PRESET S6 · RESET S6 · PRESET · S2 S3 S4 · S5 STOP HOLD RUN REM

FLOAT CR1 · CR2

J2 · J3 · J1 · P1 · SPARES

A3 DISPLAY DRIVER & DECODER

SCH 12307908-1
ASSY 00307908-1

A1
MPU & POWER SUPPLY
SCH 12307962-1
ASSY 00307962-1

12VDC · TB1 · BT1 · BT2 · J101 · FL1 · F101 · POWER · S1 · OFF/CHG

Q101 2N4918 · Q102 2N4921 · U101 MC 7805CP VCC A · U102 MC 7805CP VCC B

J104 1MHz IN

A2
GENERATOR
SCH 12307909-1
ASSY 00307909-1

EXT · INT · J103 CODE OUT

A3-A1 P/O A3 · DISPLAY PWR · GND · VCC A · U103 MC 7805CP

16 LINES · 37 LINES

U3 · U4

D15 PARALLEL OUTPUT OPTION

BCD/PULSE RATE

J102
57-040500
P/O A1

22	STOP
23	HOLD
24	RUN
25	REM
47	DC CODE
48	RESET
20	1 PPS
44	COIN M
49	GND
50	CHASSIS GND
19	COIN L
21	COIN CLEAR
45	CARRIER
17	100 DAY
18	200 DAY
42	400 DAY
22	800 DAY
1	1 SEC
2	2 SEC
26	4 SEC
27	8 SEC
3	10 SEC
4	20 SEC
28	40 SEC
29	80 SEC
5	1 MIN
6	2 MIN
30	4 MIN
31	8 MIN
7	10 MIN
8	20 MIN
32	40 MIN
33	80 MIN
46	READ INH
9	1 HR
10	2 HR
34	4 HR
35	8 HR
11	10 HR
12	20 HR
36	40 HR
37	80 HR
13	1 DAY
14	2 DAY
38	4 DAY
39	8 DAY
15	10 DAY
16	20 DAY
40	40 DAY
41	80 DAY

LIST OF MATERIALS

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

8720 · USED ON · NEXT ASSY · APPLICATION

DRAWN T.M.W. 2-15-78 · CHECK · ELECT. · MECH. · PROJECT · QA · SCALE · DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.03 .XX ±.010 .XXX ±.005 ANGLES ±2°

MATERIAL

AUSTRON AUSTIN, TEXAS

CODE IDENT. 24672

BLOCK DIAGRAM

DRAWING NO. REF X · SIZE D · PART NO. 12307918-1 · REV C

SH 1 OF 1

ASSEMBLY SHIPPING ASSY 8720
ASSEMBLY NUMBER 30608664-2
REFERENCE DESIGNATOR PREFIX
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
A1	FINAL ASSY 8720	25607918-2		24672
1P102	CONN 50 PIN PLUG	551306-0050	57-30500	02660
1W1	POWER CORD	570076-0007	17500B	70903

ASSEMBLY FINAL ASSY 8720
ASSEMBLY NUMBER 25607918-2
REFERENCE DESIGNATOR PREFIX 1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
A1	PANEL ASSY, FRONT 8720	10907916-1		24672
A2	PANEL ASSY, REAR	10907902-3		24672
A3	CHASSIS CKT. ASSY 8720	20607917-2		24672
MP1	TILT STAND, HALF RACK BOX	01100716		24672
MP2	FOOT LEFT HND W/BAIL	520206-0011	PP40012-1	21604
MP3	FOOT RHT HND USE W/BAIL	520206-0012	PP40012-2	21604
MP4	FOOT REAR MOLD POLYPR	520206-0013	PP40013-1	21604
MP5	FOOT REAR MOLD POLYPR	520206-0013	PP40013-1	21604

ASSEMBLY PANEL ASSY, FRONT 8720
ASSEMBLY NUMBER 10907916-1
REFERENCE DESIGNATOR PREFIX 1A1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
MP1	WINDOW	02007860		24672
P2	HEADER, 14 PIN DIP	551008-0015	CP-14P-07	52072
P2MP1	COVER HEADER 14DIP W/SIDE SLOT	520094-0001	14-200-S1000	52072
P3	HEADER, 14 PIN DIP	551008-0015	CP-14P-07	52072
P3MP1	COVER HEADER 14DIP W/SIDE SLOT	520094-0001	14-200-S1000	52072
S1	SW, TOGGLE 3PDT ON-NONE-ON LCK BAT	553304-0014	7301KYZQ	09353
S1MP1	NUT DRESS 1/4-40 NICK/PLATE	401000-0000	B7099	09353
S2	SW THUMBWHEEL SEE DRAWING 071858	553101-0011	29-5-84	07126
S3	SW, THUMBWHEEL L BCD	553101-0005	29078/B	07126
S4	SW, THUMBWHEEL L BCD	553101-0005	29078/B	07126
-MP1	BKT PR SWEND MT BLK MATTE 2900 SER	520835-0041	29-06005-2	07126
-MP2	BKT PR SWEND MT BLK MATTE 2900 SER	520835-0041	29-06005-2	07126
-MP3	SWITCH STRAP PAIR 3 DIGIT	553018-0020	29-57-001-3	07126
-MP4	SWITCH STRAP PAIR 3 DIGIT	553018-0020	29-57-001-3	07126
S6	SW, TOGGLE SPDT ON-OFF-ON MIN	553304-0012	7105SYZQ	09353
S6MP1	NUT DRESS 1/4-40 NICK/PLATE	401000-0000	B7099	09353

ASSEMBLY PANEL ASSY, REAR
ASSEMBLY NUMBER 10907902-3
REFERENCE DESIGNATOR PREFIX 1A2
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
F101	FUSE 3AGSB 1/8 AMP 250	552001-0001	MDL1/8	71400
J101	FILTER LINE 3 AMP 115V-230V	799005-0003	3EF1	05245
J103	CONN, BNC	551100-1094	UG-1094A/U	74868
-MP1	INSULATOR UG 1094/U BNC	520025-1094	10221N	07047
-MP2	WASH FIBER FLAT .380.X630X.016	510900-0016	F-7716-380	61000
J104	CONN, BNC	551100-1094	UG-1094A/U	74868
-MP1	INSULATOR UG 1094/U BNC	520025-1094	10221N	07047
-MP2	WASH FIBER FLAT .380.X630X.016	510900-0016	F-7716-380	61000
TB1	TERM BLK 2TERM 3/8CTR 1.125MT 1/8P	520000-0005	2-176-3	00000
XF1	MIN FUSEHOLDER,R/ANGLE 20AMP S-250V	507002-0003	342004	75915

ASSEMBLY CHASSIS CKT. ASSY 8720
ASSEMBLY NUMBER 20607917-2
REFERENCE DESIGNATOR PREFIX 1A3
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
A1	ASSY MPU & POWER SUPPLY BOARD	10307962-1		24672
A2	ASSY-GENERATOR BOARD	10307909-1		24672
A3	PCB ASSY DISPLAY DRIVER	10307908-1		24672
Q101	30W XSTR SIPNP	7022N4918	2N4918	81349
Q102	XSTR SINPN	7022N4921	2N4921	04713
U101	IC VOLTREG 5V 1.5A 6W/C TJ150	703MC7805CT	MC7805CT	04713
U102	IC VOLTREG 5V 1.5A 6W/C TJ150	703MC7805CT	MC7805CT	04713
U103	IC VOLTREG 5V 1.5A 6W/C TJ150	703MC7805CT	MC7805CT	04713
XQ101	CONN TRANSISTOR, 3-PIN FEMALE	551117-0044	10-01-2031	27264
-P1	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P2	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P3	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
XQ102	CONN TRANSISTOR, 3-PIN FEMALE	551117-0044	10-01-2031	27264
-P1	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P2	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P3	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
XU101	CONN TRANSISTOR, 3-PIN FEMALE	551117-0044	10-01-2031	27264
-P1	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P2	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P3	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
XU102	CONN TRANSISTOR, 3-PIN FEMALE	551117-0044	10-01-2031	27264
-P1	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P2	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P3	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
XU103	CONN TRANSISTOR, 3-PIN FEMALE	551117-0044	10-01-2031	27264
-P1	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P2	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264
-P3	TERMINAL IC SOCKET 18-24 PIN	551015-9996	08-56-0106	27264

5.3. MPU AND POWER SUPPLY
(Dwg. No. 12307962-01, sheets 1 & 2)

Sheet 1 of schematic Dwg. No. 12307962-01 shows the interconnection between the microprocessor (U5), the programmable read only memory (PROM) (U6) and the interface adapters (PIA) (U1), (U2), (U3) and (U4).

The microprocessor (U5) has internal clock circuits. These circuits operate at a 4 MHz rate and require an external crystal for frequency control. This crystal is shown on the left side of the drawing. This clock circuit is used only by the processor and is not used to keep time.

The PROM (U6) contains all the instructions to cause the processor to control the unit as a time code generator. This unit is factory programmed and cannot be reprogrammed in the field.

Interface circuits (U1) and (U2) connect the other sections of the unit to the processor. Circuits (U3) and (U4) are only used when the unit has the parallel BCD output option installed.

Sheet 2 of Dwg. No. 12307962-01 shows the power supply and battery charging circuits. In the upper left section are the power transformer and the rectifier circuits. This is the standard capacity input power supply. The dc voltage between pins 5 and 8 of the transformer is 12.6 Vac $\pm$1 Vac. The dc voltage across C1 is about 17 Vdc when the unit is powered up.

When the unit is powered from a dc source, the dc is fed to C1 through CR1. Normally the voltage from the ac power is higher at C1, back biasing CR1 so no power is supplied by the dc source.

When the power switch is in the ON position, display power is supplied from C1, through CR10 and Q102 to the display drivers. The MPU and generator circuits are supplied through C10 to regulators (U101) and (U102).

When the unit is supplied with the internal battery option, IC (U8) and the circuit made up of Q1, Q2, Q3 and Q4 maintain the battery in a fully charged state at all times.

IC (U8) and Q101 form a voltage regulator circuit to regulate the voltage across the battery. This regulator is current limited to approximately 800 mA; it limits the current when the battery is in a low charge state.

When the battery is charging, the amperage drop across CR6 and CR7 is high enough to turn Q2 on causing the regulated voltage to be 9.6 Vdc ±0.1 Vdc. (See Section Four for adjustment.) As the battery charges and the charging current drops, the voltage across CR6 and CR7 also drops at 25 mA, Q2 turns off and the regulated voltage drops to 9 Vdc ±0.1 Vdc. This is the float voltage for the battery.

REV	DESCRIPTION				
A	SH. 1 : ADDED NOTES ; P1-5 WAS TO J1-(NO NUMBER SH. 2 : U102 WAS MIS-LABELED U101 .	—	—	1/21/78	R.C.
B	CORRECTED VCC A & B LOCATIONS, FIWAS VIA	—	11571	4/6/78	R.M.
C	C1 WAS 4000 uF	—	11663	7/6/78	
C1	CONNECTIONS AT U5-25, U5-24, U102-42, NOT CHANGED ON U102 PER	—	NRC	7/7/78	
D	UG WAS 8252708	—	11573	8/3/78	R. d/.

(REV CONTINUED SH 2)

D15 PARALLEL OUTPUT OPTION

SN74LS00N

U5 MC6802P

U6 PROM SD# 08119001

U3 MC6821P

U4 MC6821P

U2 MC6821P

U1 MC6821P

P/O P1

P/O J1

P/O J102

NOTES

1. IRIG B CONFIGURATION SHOWN—
   NASA 36 — ADD W6.
   IRIG A — ADD W8.
   XR3 (250 HZ) — ADD W7.
   XR3 (1 KHZ) — ADD W7.
2. LEAP YEAR (366 DAYS) — ADD W5.

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

LIST OF MATERIALS

DRAWN T.M.H. 2-10-78	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.1 .XX ±.03 ANGLES ±	AUSTRON AUSTIN, TEXAS	MPU POWER SUPPLY
CHECK DATE		CODE IDENT. 53947	
ELECT. DATE			
MECH. DATE			
PROJECT DATE			
QA DATE			
SCALE DO NOT SCALE DRAWING	SH 1 OF 2	MATERIAL	DRAWING NO. REF D SIZE 12307962-1 REV H
8720 USED ON NEXT ASSY			
APPLICATION			

REV	DESCRIPTION	ENG. NO.	ECO NO.	DATE	APP. BY
F	W11 & W12 WERE F1, F2 (063-80)	056+	3973	4/78	G. Hill
G	C2 WAS, 1000 PF		4467	5-79	
H	DWG NO. WAS 07196201		4837		

+12V DC

115/230V 48-440 Hz

J101 (FL1)

F1 3AGSB 1A

T1 SIGNAL LP-12-900

W1 W2 W3

SEE NOTE 3

CR1 CR2 CR3 CR4 CR5

C1 4700µF 25V

W4 SEE NOTE 5

Q101 2N4918

S1

CR9 IN4151

CR10

R19 200Ω

Q102 2N4921

CR12 IN4151

DISPLAY POWER

PS DISPLAY

DISPLAY

COIN

+12V/BATT

C2 .1µF

U8 LM 723 (VREF)

R1 2.7Ω 1/2W R2 2.7Ω 1/2W R3 2.7Ω 1/2W

CR8

FLOAT

R5 5K R6 680Ω R9 5.1K R7 50K CHARGE R14 160Ω R8 30K R15 18K R4 22K

Q2 2N2907 Q4 2N3904 Q1 2N3904 Q3 2N3904

R10 18K R12 18K R11 10K R13 10K

CR6 CR7

R16 22Ω 1/2W

R17 RXX 1/2W R18 12Ω 1/2W

CR11

TP1 BLK TP2 RED

BT1 4V BT2 4V

S1

POWER OFF/CHG

FLOAT

GLOBE GC426-1-A

IN REF U101 OUT 7805 +5V A

C3 39µF 10V W11 Vcc A

Vcc A

IN REF U102 OUT 7805 +5V B

C4 39µF 10V W12 Vcc B

Vcc B

SW/BATT

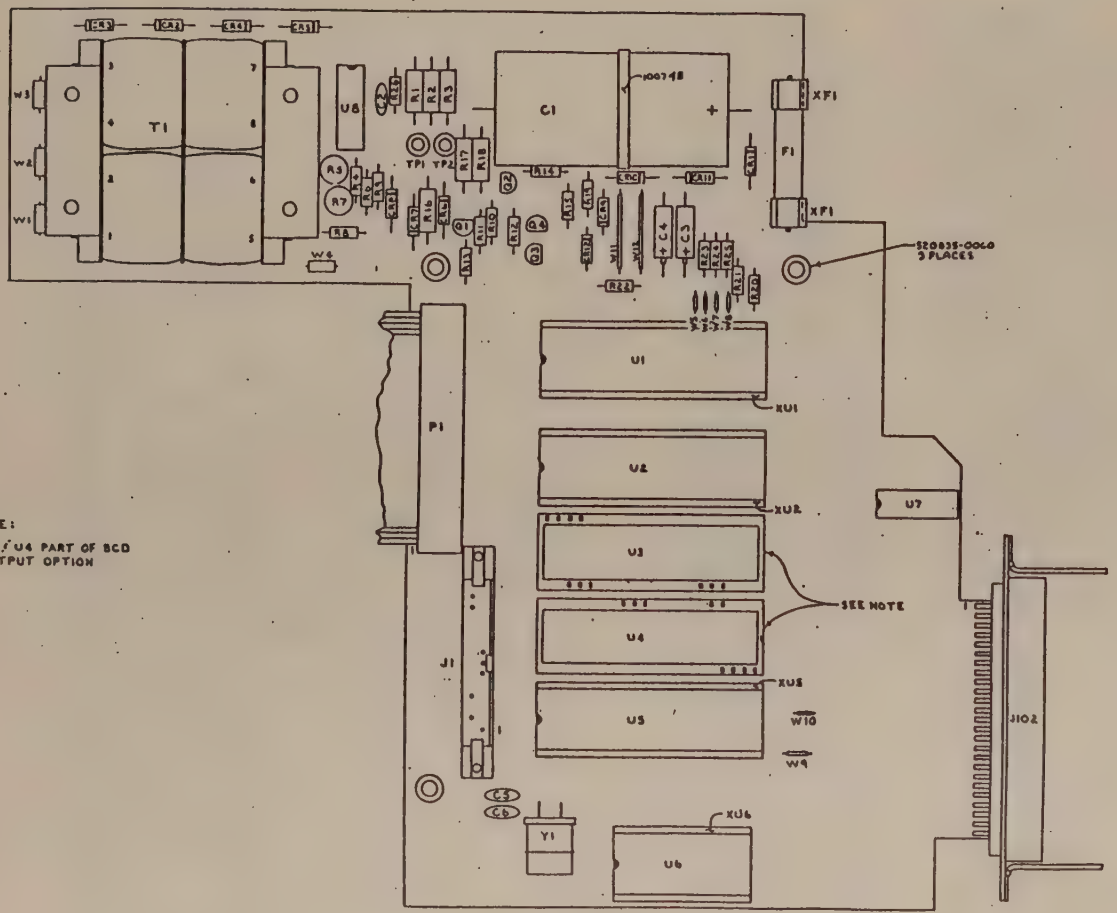
NOTES: (UNLESS OTHERWISE SPECIFIED)

1. RESISTORS ARE 1/4 W, 5%, CARBON COMP
2. DIODES ARE IN4005
3. FOR 115V OPERATION INSTALL JUMPERS W1 & W2
   FOR 230V OPERATION INSTALL JUMPER W3
4. INTERCONNECT
   ○ = WIRE TERMINATION
   □ = P1
   ⬡ = J1
5. TO DISCONNECT POWER GROUND FROM CHASSIS GROUND REMOVE W4

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

LIST OF MATERIALS

DRAWN T.M.H. 1-27-78	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE X ±, XX ±, .XXX ±, ANGLES ±	AUSTRON AUSTIN, TEXAS	MPU & POWER SUPPLY
CHECK DATE			
ELECT. DATE		CODE IDENT. 24672	
MECH. DATE			
PROJECT DATE			
QA DATE			
8720	DO NOT SCALE DRAWING	MATERIAL	DRAWING NO.
USED ON / NEXT ASSY	SCALE		REF: D SIZE: 12307962-1 PART NO. H REV
APPLICATION	SH 2 OF 2	5-12	



NOTE:

U3 & U4 PART OF BCD OUTPUT OPTION

OPTIONS		
ASSY.	CODE	JUMPERS USED
01	IRIG B	W1, W2, W4, W9
02	XR 3	W1, W2, W4, W7, W9
03	NASA 36	W1, W2, W4, W6, W9
04	IRIG A	W1, W2, W4, W8, W9

REV	DESCRIPTION	ECO NO.	DATE	APPD
A				
B	ADDED C5, C6, R24 & P1, J1 TO NOTE ON SHT 2	1006	11-5-19	
B1	ADDED OPTION 5 BLOCK & JUMPER PREVIOUSLY OMITTED	-	-	
C	CHANGED PER ECO		11-5-60	
D	SHT 2 - P1 WAS 1/A4, CHG'D NOTE 1, ADD NOTE 2		11-9-71	
E	C1 WAS 4000 MF		11-6-73	
E1	ADDED ASSY NOTE TO EL. CAPS ECO 001-80		MFC	
F	W11 & W12 WERE 11 GA 12	(082 501)	10306	1-29-82
F1	U5 WAS 5252708, (SEA 077-P1)	(SEA 077-P1)	MFC	
G	C2 WAS 1000 PF		4-6-83	
H	REMOVED "NOTE 1" FROM U3 TO U6 LOCATION - SHT 2		4-11-84	
J	CABLE FOR P1 WAS ON RIGHT SIDE OF P1		5029	5-6-86
K	DWG. NO. WAS 07196701		6837	
L	REVISED PILOT PER ECO 6498	-	-	10-5-88

LIST OF MATERIALS

AUSTRON
AUSTIN, TEXAS

CODE IDENT. 24678

ASSY
MPU / POWER
SUPPLY BOARD

DRAWING NO. 10307962-1 REV L

6720

APPLICATION

SCALE 2:1

SHT 1 OF 2

5-13

ASSEMBLY ASSY MPU & POWER SUPPLY BOARD
ASSEMBLY NUMBER 10307962-1
REFERENCE DESIGNATOR PREFIX 1A3A1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
CR1	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR2	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR3	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR4	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR5	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR6	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR7	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR7	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR8	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR8	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR9	50V DIO SIG	7011N4151	1N4151	13715
CR10	50V DIO SIG	7011N4151	1N4151	13715
C1	4700UF 25V CAP ELECTROLYTIC	602003-0081	478TTA025A	74840
C2	.1 UF 50V 20 CAP CER DP	601009-0104	2C37Z5U104M050B	56289
C3	39 UF 10V 10 CAP TANT	608114-0396	150D396X9010B2	56289
C4	39 UF 10V 10 CAP TANT	608114-0396	150D396X9010B2	56289
C5	18 PF 500V 5 CAP DIP MICA	603000-0180	DM15-180J	72136
C6	18 PF 500V 5 CAP DIP MICA	603000-0180	DM15-180J	72136
F1	FUSE 3AGSB 1 AMP 250V	552001-0020	313001	75915
J1	CONN PCB HEADER 26 PIN MALE	551305-0050	3429-2002	53387
J102	CONN 50 PIN SOCKET	551306-0051	57-40500	02660
P1	CABLE ASSY DISPLAY DRIVER	11507911-1		24672
Q1	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q2	1.8W TO-18 XSTR PNPS SH	7022N2907A	2N2907A	81349
Q3	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q4	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
R1	RES FXD COMP 2.7 OHM 1/2W 05%	651101-02R7	RC07GF2R7J	81349
R2	RES FXD COMP 2.7 OHM 1/2W 05%	651101-02R7	RC07GF2R7J	81349
R3	RES FXD COMP 2.7 OHM 1/2W 05%	651101-02R7	RC07GF2R7J	81349
R4	RES FXD COMP 22 K 1/4W 10%	651102-0223	RC07GF223K	81349
R5	5 K 1/2W 20 POT 1T PC CERM	659009-1502	3329H-1-502	80294
R6	RES FXD COMP 680 OHM 1/4W 10%	651102-0681	RC07GF681K	81349
R7	RES VAR CERMET 50 K 1/2W 10%	659008-0503	82PR50K	73138

ASSEMBLY ASSY MPU & POWER SUPPLY BOARD (CONT)
ASSEMBLY NUMBER 10307962-1
REFERENCE DESIGNATOR PREFIX 1A3A1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
R8	RES FXD COMP 30 K 1/4W 05%	651100-0303	RC07GF303J	81349
R9	RES FXD COMP 5.1 K 1/4W 05%	651100-0512	RC07GF512J	81349
R10	RES FXD COMP 18 K 1/4W 10%	651102-0183	RC07GF183K	81349
R11	RES FXD COMP 10 K 1/4W 10%	651102-0103	RC07GF103K	81349
R12	RES FXD COMP 18 K 1/4W 10%	651102-0183	RC07GF183K	81349
R13	RES FXD COMP 10 K 1/4W 10%	651102-0103	RC07GF103K	81349
R14	RES FXD COMP 160 OHM 1/4W 05%	651100-0161	RC07GF161J	81349
R15	RES FXD COMP 18 K 1/4W 10%	651102-0183	RC07GF183K	81349
R16	RES FXD COMP 22 OHM 1/2W 10%	651103-0220	RC20GF220K	81349
R18	RES FXD COMP 12 OHM 1/2W 10%	651103-0120	RC20GF120K	81349
R19	RES FXD COMP 200 OHM 1/4W 05%	651100-0201	RC07GF201J	81349
R20	RES FXD COMP 3 K 1/4W 05%	651100-0302	RC07GF302J	81349
R21	RES FXD COMP 3 K 1/4W 05%	651100-0302	RC07GF302J	81349
R22	RES FXD COMP 100 K 1/4W 10%	651102-0104	RC07GF104K	81349
R23	RES FXD COMP 100 K 1/4W 10%	651102-0104	RC07GF104K	81349
R24	RES FXD COMP 100 K 1/4W 10%	651102-0104	RC07GF104K	81349
R25	RES FXD COMP 100 K 1/4W 10%	651102-0104	RC07GF104K	81349
R26	RES FXD COMP 1 K 1/4W 10%	651102-0102	RC07GF102K	81349
TP1	TESTPOINT, PC, BLK RIGHT ANGLE	551112-0009	105-0853-001	74970
TP2	TESTPOINT, PC, RED RIGHT ANGLE	551112-0010	105-0852-001	74970
T1	XFMR PWR 12.6V CT @ 900 MA 115/230	751310-0900	LP-12-900	08779
U1	PERIPHERAL INTERFACE ADAPTER	703MC6821P	MC6821P	04713
U2	PERIPHERAL INTERFACE ADAPTER	703MC6821P	MC6821P	04713
U3	SEE OPTION (D15)			
U4	SEE OPTION (D15)			
U5	IC CMOS MICROPROCESSOR W/CLOCK/RAM	703MC6802P	MC6802P	04173
U6	N82S181N W/PROG 8720	7600908190-1		24672
U7	IC QUADR 2-INP NAND GATE	703SN74LS00N	SN74LS00N	01295
U8	IC VOLTREG 2-37V .15A DIP	703LM723CN	LM723CN	27014
W1	JUMPER 22AWG INSULATED	520440-2007	L-2007-1	55210
W2	JUMPER 22AWG INSULATED	520440-2007	L-2007-1	55210
W4	JUMPER 22AWG INSULATED	520440-2007	L-2007-1	55210
XF1-A	CLIP FUSE SINGLE PC/MT	552007-0000	102071	75915

ASSEMBLY ASSY MPU & POWER SUPPLY BOARD (CONT)
ASSEMBLY NUMBER 10307962-1
REFERENCE DESIGNATOR PREFIX 1A3A1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
XF1-8	CLIP FUSE SINGLE PC/MT	552007-0000	102071	75915
XU1	SOCKET, IC 40 PIN DIP, CLOSED ENT	551016-0003	IC-640-SGT	55322
XU2	SOCKET, IC 40 PIN DIP, CLOSED ENT	551016-0003	IC-640-SGT	55322
XU3	SOCKET, IC 40 PIN DIP, CLOSED ENT	551016-0003	IC-640-SGT	55322
XU4	SOCKET, IC 40 PIN DIP, CLOSED ENT	551016-0003	IC-640-SGT	55322
XU5	SOCKET, IC 40 PIN DIP, CLOSED ENT	551016-0003	IC-640-SGT	55322
XU6	SOCKET, IC 24 PIN DIP, CLOSED ENT	551016-0004	IC-624-SGT	55322
Y1	XTAL, 4.000000 MHZ	752A4000000	SCM18	27073

5.4. GENERATOR PCB
(Dwg. No. 12307909-01)

Shown in the upper left of Dwg. No. 12307909-01 is the 1 MHz oscillator circuit. This is a crystal controlled oscillator with adjustable capacitor C1 to adjust the frequency to a precise 1 MHz signal.

The output of the oscillator (U2,14) goes to the Internal/External time base select switch S101. S101 switches the time base for the reset of the instrument. From the switch the signal goes to the count chain made up of (U5), (U6), (U7) and (U9). The count chain divides the 1 MHz signal to the rates required by other sections of the unit.

IC (U11) divides the carrier rate by ten to supply a bit rate signal to the MPU from (U4,10). The carrier rate is supplied to the MPU by (U4,2). IC (U10,12) controls STOP/RUN operation of the Model 8720.

IC (U8,10) supplies a square wave (at the carrier frequency) to the shaper circuit Q8, Q9 and Q10. Q8 and Q9 form an active filter that filters the square wave to a sine wave of the same frequency. Q10 is a source follower to isolate the filter from the load. The output of the shaper is fed to the output amplifier (U12) through resistor R32. This register forms part of the modulator circuit.

The level shift time code is generated by (U3) under the control of the MPU via inputs CP1, CP2, CP4 and CP8. This level shift code is fed to the gate of Q7. If the level shift code is low, Q7 turns on causing the filter output through R32 to be attenuated. This processed filter output (modulated carrier) is fed to the output amplifier (U12). The output amplitude is controlled by the amplitude control R35.

The circuit formed by Q3, Q4, Q5 and Q6 is a voltage doubler circuit. This circuit supplies the power for the shaper and the output amplifier.

The input to Q3 is a 10,000 pps square wave. Q4 forms a standard totem pole output to drive the chopper circuit of Q5 and Q6. Diodes CR3 and CR4 with capacitors C8 and C9 form the voltage doubler circuit.

REVISIONS					
REV	DESCRIPTION	ENG. NO.	ECO NO.	DATE	APP'D
A1	ADDED NOTE 4 & MISSING REF. DES. "Q1".	—	—	4/24/78	
A2	ADDED 39 pf NOM. - TO C2	—	—	9/19/78	
B	PER ECO	—	11629	11/30/78	
C	C10 & 11 MADE CXX- R24, 25, 26, 27 CHG'D VALUES	—	11663	3/79	
D	CHG'D R29 470Ω TO RAX, 0Ω. ECR 139-80		17212	9/5/80	
E	C2 WAS 39 pF		5011	4/84	
F	DWG. NO. WAS 07190901		9837	8/6/84	

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. RESISTORS ARE ¼ W, 5% CARBON COMP
2. IC's

IC	TYPE	GND	VDD
U1 — MC14081 BCP	QUAD 2-INPUT "AND" GATE	7	14
U2 — MC14049 BCP	HEX INVERTING BUFFER	8	1
U3 — MC14526 BCP	PROM DIVIDE-BY-N 4 BIT COUNTER	8	16
U4 — MC14050 BCP	HEX NON INVERTING BUFFER	8	1
U5,6,7,11 — MC14017 BCP	DECADE COUNTER/DIVIDER	8	16
U8 — MC14071 BCP	QUAD 2-INPUT "OR" GATE	7	14
U9,10 — MC14013 BCP	DUAL TYPE D FLIP-FLOP	7	14

3. PADS 5,6,7,8 ARE FOR M S OPT
4. IRIG B CONFIGURATION SHOWN—
   NASA 36—SAME AS IRIG B
   IRIG A—REMOVE W2,W5 ; ADD W3 W4 ; C12 & C13 ARE .001 μf.
   XR3 (250 Hz)—REMOVE W2,W5,W7; ADD W1,W6,W8 ; C12 & C13 ARE .039 μf.
   XR3 (1 KHz)—REMOVE W2,W7; ADD W1, W8 (C12 & C13 AS SHOWN).

1MH$_2$ IN, EXT, S101 INT, C4 1000 pf, R2 47K, R3 12K, R4 390Ω, R5 100Ω, R6 100Ω, C5 1000pf, Q1 2N3904, CR1 1N4151, R7 1K, Q2 2N3904, +5

U1, U2, Y1, C1 .8-18pf, C2 18 pf, R1 10M, C3 33pf

U5, U6, U7, P/O U9

U11, C5 100pf, R9 33K, R10 2.2K, U4, U8, W1 250PPS, W3 W2 1KPPS, 10KPPS

R11 33K, +5, S1, C7 1μf

R8 10K, U1, U2, P/O U10, U3 '0' INH, MR DP1 DP2 DP3 DP4, CF PE MR

W7, W8, U2, R19 10K, C21 1000pf, Q7 2N5461, R20 1M

R12 10K, R13 10K, R14 1K, R15 1K, Q4 2N3904, R16 1K, Q5 2N2907, CR2 1N4151, Q3 2N3904, CR3 1N4005, CR4 1N4005, C8 22μf 35V, R17 1K, R18 1K, Q6 2N2222, C9 10μf 20V

R21 RATIO 10K

R24 1.3K, R25 160K, Q8 2N5459, C12 CXX .01μf NOM, R26 12K, R29 RXX 0Ω NOM., Q10 2N5459, VR1 IN748A 3.9V, C11 CXX NOM 2200pf, R22 68K, C10 CXX NOM 2200pf, R23 68K, Q9 2N3904, R27 24K, R30 5.6K, C13 CXX NOM .01μf, R31 10K, R32 8.2K, C14 1μf

R35 AMPLITUDE 100K, C16 470pf, R37 27K, C15 1μf, C17 1μf, C19 10μf, U12 LM301, C18 33pf, R33 100K, R34 100K, C20 47μf, R36 10K, 3 CODE OUT, 4

P1: 12 COIN CLEAR, 26 COIN RESET, 21 COIN M, 8 COIN L, 25 COIN LED, 5 100 PPS, 16 CP1, 17 CP2, 18 CP4, 19 CP8, 13 CARRIER, 7 1PPS, 24 STOP, 15 RESET, 23 RUN, 4 6 20 1 2 9 10 11 3 1KPPS, 14 DC CODE, 22 SW BATT

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO

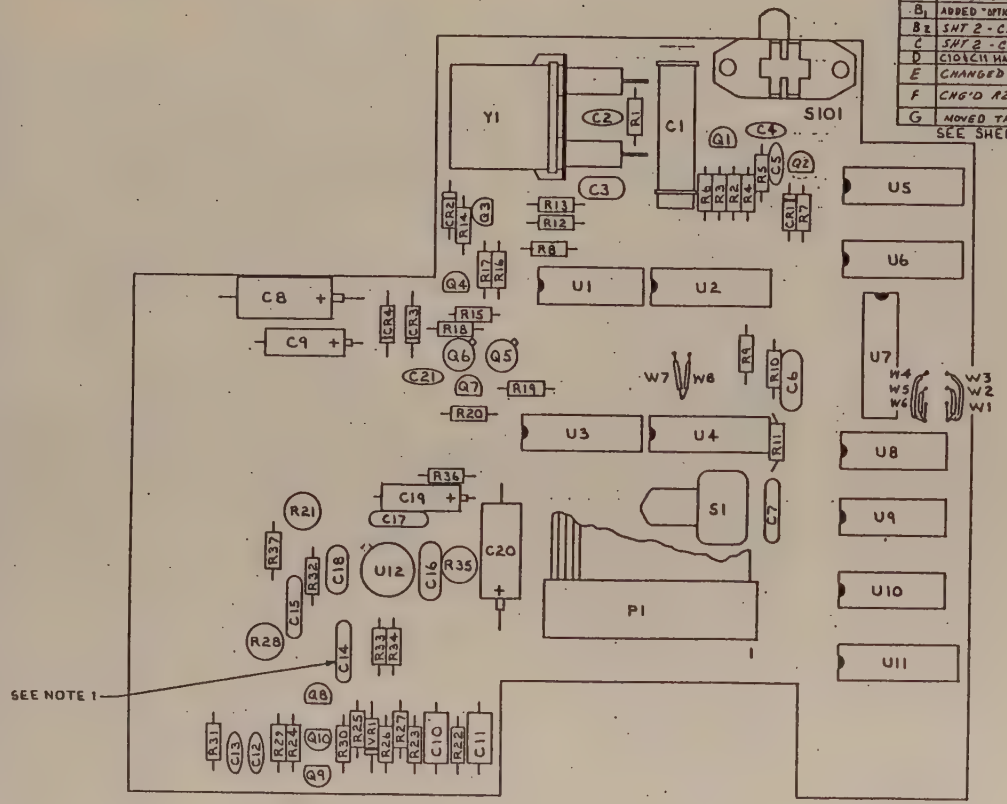
LIST OF MATERIALS

DRAWN	DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.1 .XX ±.01 .XXX ±.005 ANGLES ±	AUSTRON AUSTIN, TEXAS
CHECK	DATE		GENERATOR BOARD
ELECT.	DATE		CODE IDENT. 21672
MECH.	DATE		
PROJECT	DATE		
QA	DATE		
8720 USED ON	NEXT ASSY	SCALE DO NOT SCALE DRAWING	SH 1 OF 1
APPLICATION			MATERIAL

DRAWING NO.

REF	SIZE	PART NO.	REV
	D	12307909-1	F

A



REVISIONS					
REV	DESCRIPTION	SER. NO.	ECO NO.	DATE	APP. BY
A_1	DELETED NOTE FROM SH 2 ; "PRE-ASSY. NOTE: MOUNT CRYSTAL SOCKET WITH EYELETS, 3-3 PN 101534, BOARD ASSEM"		—	7/4/78	
A_2	REVERSED DIRECTION OF C1 / ADDED SLOT NOTE		NFC	7/20/78	
B	ADDED SOLDERING NOTE ON SHT 2	1006	11519	2/7/80	
B_1	ADDED "OPTIONS" BLOCK & JUMPERS PREVIOUSLY NOT SHOWN.	—	-	11/14	
B_2	SHT 2 - CHG'D C2 FROM C1x TO 39 pf	-	-	11/19/78	
C	SHT 2 - CHG'D R3 FROM 68K TO 27K	-	11629	11/19/78	
D	C10 & C11 MADE CN-R24-27 CHANGED VALUES	—	11663	3/79	
E	CHANGED POSITION OF Q2 ECR 075-80	—	13996	5/5/80	
F	CHG'D R29 470Ω TO 0Ω. ECR 179-80		17212	7/1/80	
G	MOVED TAB ON U12		5006	7/10/84	

SEE SHEET 2 FOR ADDITIONAL REVISIONS

OPTIONS

ASSY.	CODE	JUMPERS USED	C12, C13 VALUE
01	IRIG B NASA 36	W2, W5, W7	.01 μf
02	XR3 (250 Hz)	W1, W6, W8	.039 μf
03	XR3 (1 KHz)	W1, W5, W8	.01 μf
04	IRIG A	W3, W4, W7	.001 μf

NOTES:
1. INSULATE LEADS OF C14 WITH TEFLON TUBING.

LIST OF MATERIALS

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO.

DRAWN T.M.H 1-5-77	DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.1 .XX ±.03 ANGLES ±	AUSTRON INC. AUSTIN, TEXAS
CHECK	DATE		
ELECT.	DATE		
MECH.	DATE		
PROJECT P.M. 1-10-77	DATE		
QA	DATE		
8720 USED ON / NEXT ASSY		SCALE 2:1	DO NOT SCALE DRAWING
APPLICATION		SH 1 OF 2	

CODE IDENT. 24672

ASSY GENERATOR BOARD

MATERIAL

DRAWING NO. REV	SIZE	PART NO.	REV
	C	0307909-1	L

ASSEMBLY ASSY-GENERATOR BOARD
ASSEMBLY NUMBER 10307909-1
REFERENCE DESIGNATOR PREFIX 1A3A2
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
CR1	50V DIO SIG	7011N4151	1N4151	13715
CR2	50V DIO SIG	7011N4151	1N4151	13715
CR3	400V 1.5A DIO REC	7011N5395	1N5395	04713
CR4	400V 1.5A DIO REC	7011N5395	1N5395	04713
C1	CAP VAR PSTN PCMTG .8-18PF Q=500	609525-0001	GGC18000	56289
C2	18 PF 500V 5 CAP DIP MICA	603000-0180	DM15-180J	72136
C3	33 PF 500V 5 CAP DIP MICA	603000-0330	DM15-330J	02799
C4	.001 UF 1KV 20CAP	601011-0102	5GAD10	56289
C5	.001 UF 1KV 20CAP	601011-0102	5GAD10	56289
C6	100 PF 500V 5 CAP DIP MICA	603000-0101	DM15-101J	02799
C7	1 UF 50V CAP CER DP	601009-0105	2C37Z5U105M050B	56289
C8	22 UF 35V 10 CAP TANT	608017-0226	CS13BF226K	81349
C9	10 UF 20V 10 CAP TANT	608016-0106	CS13BE106K	81349
C10	.0022UF 200V 10 CAP MYLAR	604192-0009	192P22292	56289
C11	.0022UF 200V 10 CAP MYLAR	604192-0009	192P22292	56289
C12	.01UF 50V 5 POLY-FOIL POTTEDRAD	604315-0103	719D1AA103PJ500AX	99392
C13	.01UF 50V 5 POLY-FOIL POTTEDRAD	604315-0103	719D1AA103PJ500AX	99392
C14	1 UF 50V CAP CER DP	601009-0105	2C37Z5U105M050B	56289
C15	1 UF 50V CAP CER DP	601009-0105	2C37Z5U105M050B	56289
C16	470 PF 500V 5 CAP DIP MICA	603000-0471	CM05FD471J03	81349
C17	1 UF 50V CAP CER DP	601009-0105	2C37Z5U105M050B	56289
C18	33 PF 500V 5 CAP DIP MICA	603000-0330	DM15-330J	02799
C19	10 UF 20V 10 CAP TANT	608016-0106	CS13BE106K	81349
C20	47 UF 20V 10 CAP TANT	608116-0476	150D476X9020R2	56289
C21	.001 UF 1KV 20CAP	601011-0102	5GAD10	56289
P1	CABLE ASSY GENERATOR	11507911-2		24672
Q1	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q2	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q3	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q4	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q5	1.8W TO-18 XSTR PNPS SH	7022N2907A	2N2907A	81349
Q6	0.5W TO-18 XSTR NPNS SH	7022N2222	2N2222	08288
Q7	TO-92 XSTR JFET	7022N5461	2N5461	04713

ASSEMBLY ASSY-GENERATOR BOARD (CONT)
ASSEMBLY NUMBER 10307909-1
REFERENCE DESIGNATOR PREFIX 1A3A2
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
Q8	TO-92 XSTR JFET	7022N5459	2N5459	04713
Q9	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q10	TO-92 XSTR JFET	7022N5459	2N5459	04713
R1	RES FXD COMP 10 M 1/4W 05%	651100-0106	RC07GF106J	81349
R2	RES FXD COMP 47 K 1/4W 05%	651100-0473	RC07GF473J	81349
R3	RES FXD COMP 12 K 1/4W 05%	651100-0123	RC07GF123J	81349
R4	RES FXD COMP 390 OHM 1/4W 05%	651100-0391	RC07GF391J	81349
R5	RES FXD COMP 100 OHM 1/4W 05%	651100-0101	RC07GF101J	81349
R6	RES FXD COMP 100 OHM 1/4W 05%	651100-0101	RC07GF101J	81349
R7	RES FXD COMP 1 K 1/4W 05%	651100-0102	RC07GF102J	81349
R8	RES FXD COMP 10 K 1/4W 05%	651100-0103	RC07GF103J	81349
R9	RES FXD COMP 33 K 1/4W 05%	651100-0333	RC07GF333J	81349
R10	RES FXD COMP 2.2 K 1/4W 05%	651100-0222	RC07GF222J	81349
R11	RES FXD COMP 33 K 1/4W 05%	651100-0333	RC07GF333J	81349
R12	RES FXD COMP 10 K 1/4W 05%	651100-0103	RC07GF103J	81349
R13	RES FXD COMP 10 K 1/4W 05%	651100-0103	RC07GF103J	81349
R14	RES FXD COMP 1 K 1/4W 05%	651100-0102	RC07GF102J	81349
R15	RES FXD COMP 1 K 1/4W 05%	651100-0102	RC07GF102J	81349
R16	RES FXD COMP 1 K 1/4W 05%	651100-0102	RC07GF102J	81349
R17	RES FXD COMP 1 K 1/4W 05%	651100-0102	RC07GF102J	81349
R18	RES FXD COMP 1 K 1/4W 05%	651100-0102	RC07GF102J	81349
R19	RES FXD COMP 10 K 1/4W 05%	651100-0103	RC07GF103J	81349
R20	RES FXD COMP 1 M 1/4W 05%	651100-0105	RC07GF105J	81349
R21	10 K 1/2W 20 POT 1T PC CERM	659009-1103	3329H-1-103	80294
R22	RES FXD COMP 68 K 1/4W 05%	651100-0683	RC07GF683J	81349
R23	RES FXD COMP 68 K 1/4W 05%	651100-0683	RC07GF683J	81349
R24	RES FXD COMP 1.3 K 1/4W 05%	651100-0132	RC07GF132J	81349
R25	RES FXD COMP 160 K 1/4W 05%	651100-0164	RC07GF164J	81349
R26	RES FXD COMP 12 K 1/4W 05%	651100-0123	RC07GF123J	81349
R27	RES FXD COMP 24 K 1/4W 05%	651100-0243	RC07GF243J	81349
R28	1 K 1/2W 20 POT 1T PC CERM	659009-1102H	3329H-1-102	80294
R30	RES FXD COMP 5.6 K 1/4W 05%	651100-0562	RC07GF562J	81349
R31	RES FXD COMP 10 K 1/4W 05%	651100-0103	RC07GF103J	81349

ASSEMBLY ASSY-GENERATOR BOARD (CONT)
ASSEMBLY NUMBER 10307909-1
REFERENCE DESIGNATOR PREFIX 1A3A2
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
R32	RES FXD COMP 8.2 K 1/4W 05%	651100-0822	RC07GF822J	81349
R33	RES FXD COMP 100 K 1/4W 05%	651100-0104	RC07GF104J	81349
R34	RES FXD COMP 100 K 1/4W 05%	651100-0104	RC07GF104J	81349
R35	100 K 1/2W 20 RES VAR CERMET	659009-0104	3339H-1-104	80294
R36	RES FXD COMP 10 K 1/4W 05%	651100-0103	RC07GF103J	81349
R37	RES FXD COMP 27 K 1/4W 05%	651100-0273	RC07GF273J	81349
S1	SW, PB SNGL SPDT RED	553012-0036	39-250 RED	81073
S101	SW, SLIDE DPDT RT. ANGL	553007-0002	GI-152-DPDT	79727
U1	IC CMOS 4-2IN AND 14DIP	703MC14081BP	MC14081BCP	04713
U2	IC CMOS HEX INV/BUFF	703MC14049BP	MC14049UBCP	04713
U3	IC CMOS PRGML 1/N BIN DWN CN	703MC14526BP	MC14526BCP	04713
U4	IC CMOS HEX BUFFER	703MC14050BP	MC14050BCP	04713
U5	IC CMOS DEC CNTR 5STAGE JOH	703MC14017BP	MC14017BCP	04713
U6	IC CMOS DEC CNTR 5STAGE JOH	703MC14017BP	MC14017BCP	04713
U7	IC CMOS DEC CNTR 5STAGE JOH	703MC14017BP	MC14017BCP	04713
U8	IC CMOS 4 2IN OR 14DIP	703MC14071BP	MC14071BCP	04713
U9	IC CMOS DUAL D F/F,IN D,CLK	703MC14013BP	MC14013BCP	04713
U10	IC CMOS DUAL D F/F,IN D,CLK	703MC14013BP	MC14013BCP	04713
U11	IC CMOS DEC CNTR 5STAGE JOH	703MC14017BP	MC14017BCP	04713
U12	IC OP AMP	703LM301AH	LM301AH	27014
VR1	3.9V 400MW 5 DIO ZEN	7011N748A	1N748A	03877
W1	JUMPER 22AWG INSULATED	520440-2007	L-2007-1	55210
XY1	SOCKET, XTAL MTG	551016-0006	M12883-39-01	91506
Y1	XTAL 1.000000 MHZ	75281000000	CR18/U	00000

5.5. DISPLAY DRIVER
(Dwg. No. 12307908-01)

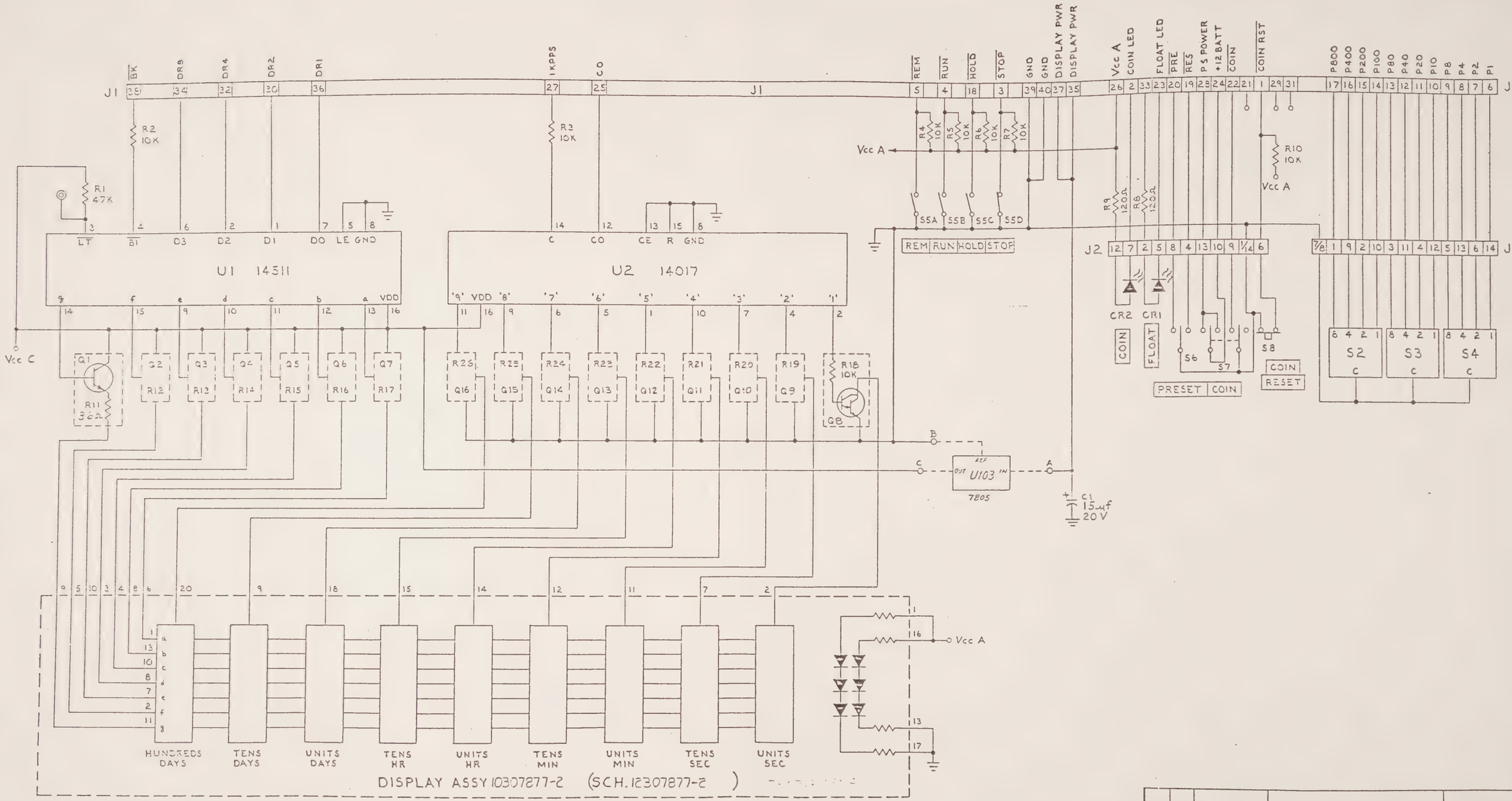
The reference drawing shows the circuits that drive the digital display. The microprocessor supplies the BCD information to the seven segment driver (U1). The outputs of (U1) are connected to the display ICs via Q1 through Q7. These transistors are connected as constant current drivers so they always supply the same current to the display.

IC (U2) is a counter that is synchronized to the information sent to the seven segment driver. This counter selects the display digit to be lit. Q8 through Q16 are buffers between the counter and display ICs. IC (U2) is counting at a 1 kHz rate so each digit is lit for one millisecond in ten.

IC (U103) is a voltage regulator that supplies the power for the display circuits. If the unit has the battery option and ac power is lost the power to (U103) is turned off so the display does not drain the batteries.

A front panel switch lights the display when the unit is operating on the batteries.

REVISIONS					
REV	DESCRIPTION	ENG NO.	ECO NO	DATE	APP. BY
A					
B	C1 WAS FROM U103-CR11-17 WERE 47Ω	—	11550	11-7-67	[illegible]
C	2B-16 & R1B-26 WERE IN WRONG ORDER	—	11663	1-4-68	[illegible]
C1	ALL "Vcc A" NOS "+5VA", U103 SHOWN MORE CLEARLY.	-	HFC	7/5/73	[illegible]
D	DWG NO. WAS 07190801		11937	4/2/165	[illegible]



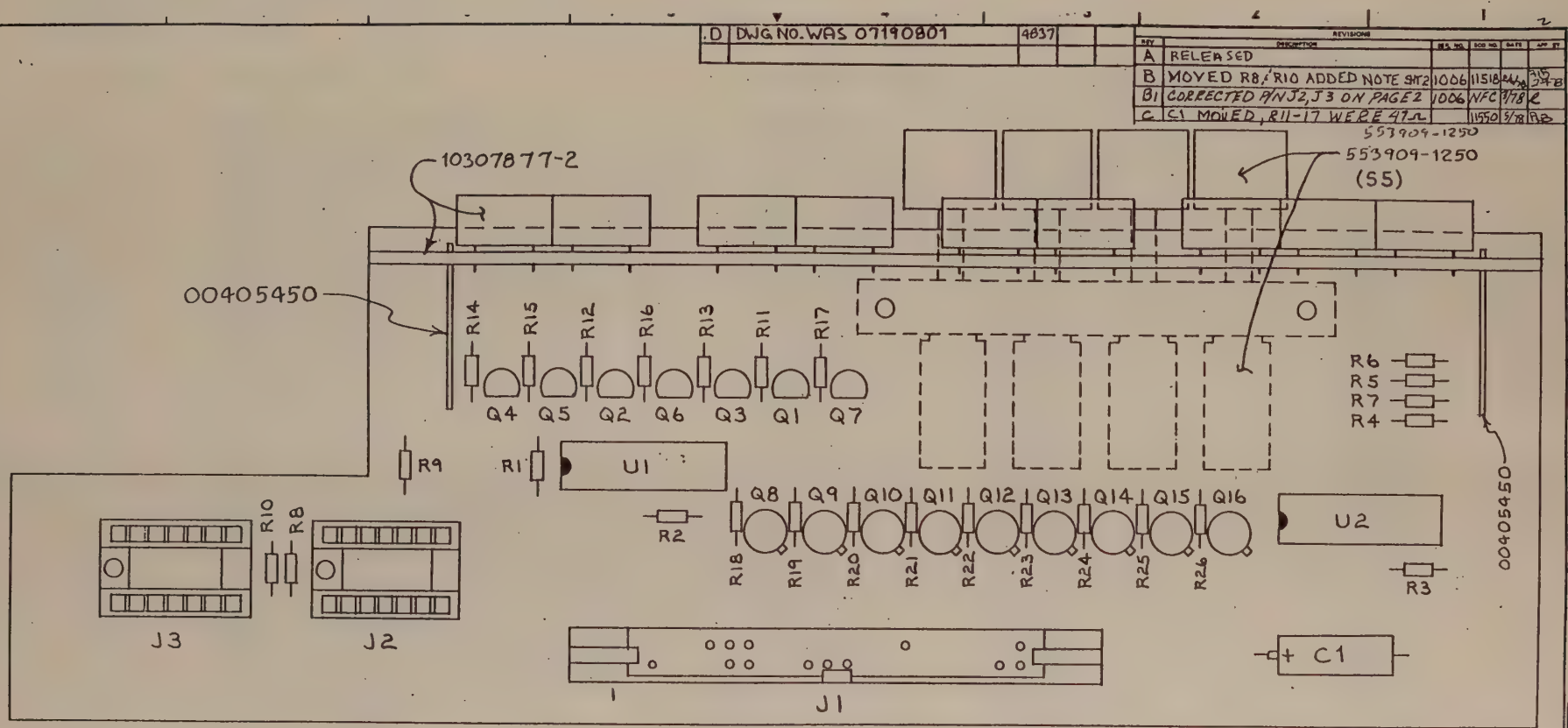
NOTES: (UNLESS OTHERWISE NOTED)

1. ALL RESISTORS ARE 5%, 1/8 W, CARBON COMP
2. Q1-Q7 ARE 2N3904, Q8-Q16 ARE 2N998

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO

LIST OF MATERIALS

DRAWN [illegible] DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	AUSTRON INC AUSTIN, TEXAS	DISPLAY DRIVER
CHECK DATE	DECIMAL TOLERANCE .X .XX .XXX ANGLES ±	CODE IDENT. 24672	
ELECT. DATE		MATERIAL	DRAWING NO. REF 7 SIZE D PART NO. 12307908-1 REV D
MECH. N/C DATE			
PROJECT DATE			
QA DATE			
SCALE	DO NOT SCALE DRAWING	SH 1 OF 1	
8720 USED ON / NEXT ASSY			
APPLICATION			



REV	DESCRIPTION	ECO NO.	DCO NO.	DATE	APP BY
A	RELEASED				
B	MOVED R8, R10 ADDED NOTE SHT 2	1006	11518	2/4/78	278
B1	CORRECTED P/N J2, J3 ON PAGE 2	1006	WFC	3/7/78	R
C	C1 MOVED, R11-17 WERE 47Ω		11550	3/8/78	BB

.D DWG NO. WAS 07190801 4837

LIST OF MATERIALS

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	REMARKS OR REF NO.

AUSTRON AUSTIN, TEXAS

CODE IDENT 24672

ASSY DISPLAY DRIVER

DRAWING NO.

A720

5-25

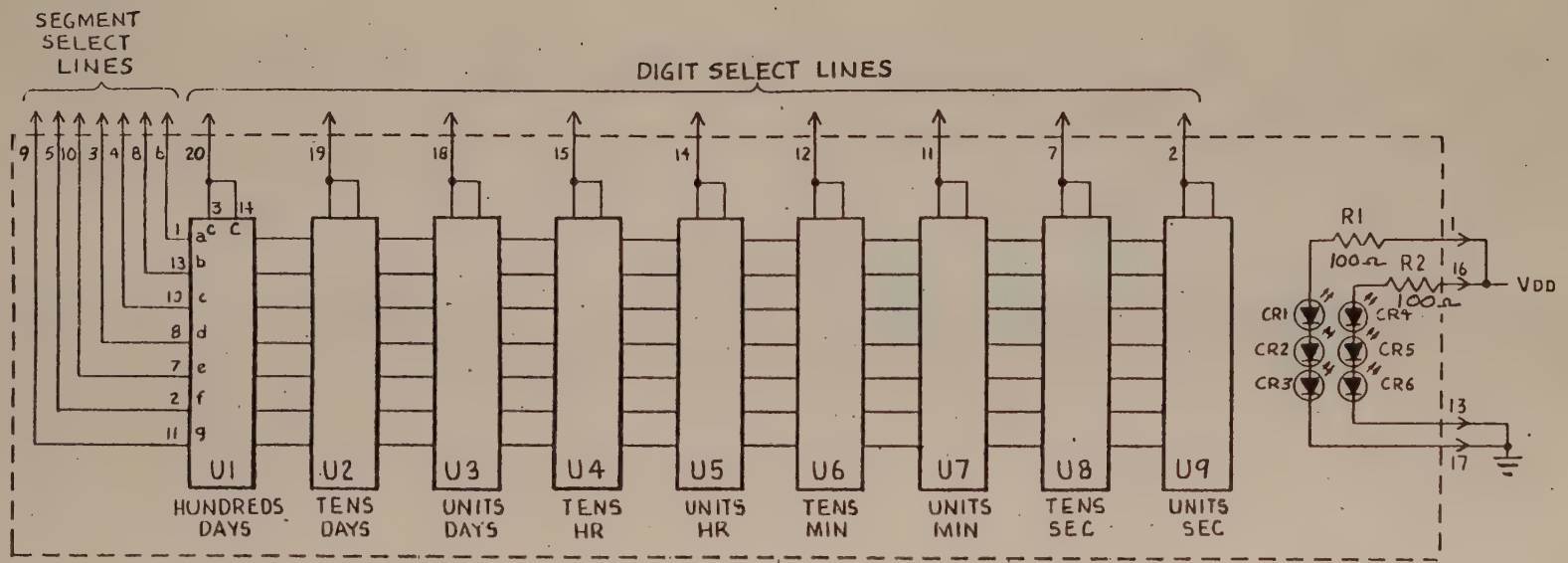
ASSEMBLY PCB ASSY DISPLAY DRIVER
ASSEMBLY NUMBER 10307908-1
REFERENCE DESIGNATOR PREFIX 1A3A3
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
A1	ASSY DISPLAY BOARD	10307877-2		24672
C1	15 UF 20V 10 CAP TANT	608016-0156	150D156X9020B2	81349
J1	CONN 40 PIN STRAIGHT W/O EJECTOR	551305-0055	3432-2002	53387
J2	SOCKET, IC 14 PIN DIP, CLOSED ENT	551016-0000	IC-314-SGT	55322
J3	SOCKET, IC 14 PIN DIP, CLOSED ENT	551016-0000	IC-314-SGT	55322
MP1	BRKT DISPLAY & DRIVER BD	00405450		24672
MP2	BRKT DISPLAY & DRIVER BD	00405450		24672
Q1	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q2	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q3	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q4	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q5	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q6	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q7	0.31W TO-92 XSTR NPNS SH	7022N3904	2N3904	81349
Q8	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q9	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q10	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q11	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q12	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q13	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q14	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q15	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
Q16	500MW 60V XSTR NPN DARLINGTON TO-72	7022N998	2N998	04713
R1	RES FXD COMP 47 K 1/8W 10%	651110-0473	RC05GF473K	81349
R2	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R3	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R4	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R5	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R6	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R7	RES FXD COMP 10 K 1/3W 10%	651110-0103	RC05GF103K	81349
R8	RES FXD COMP 120 OHM 1/8W 10%	651110-0121	RC05GF121K	81349
R9	RES FXD COMP 120 OHM 1/8W 10%	651110-0121	RC05GF121K	81349
R10	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349

ASSEMBLY PCB ASSY DISPLAY DRIVER (CONT)
ASSEMBLY NUMBER 10307908-1
REFERENCE DESIGNATOR PREFIX 1A3A3
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
R11	RES FXD COMP 36 OHM 1/8W 05%	651111-0360	RC05GF360J	81349
R12	RES FXD COMP 36 OHM 1/8W 05%	651111-0360	RC05GF360J	81349
R13	RES FXD COMP 36 OHM 1/8W 05%	651111-0360	RC05GF360J	81349
R14	RES FXD COMP 36 OHM 1/8W 05%	651111-0360	RC05GF360J	81349
R15	RES FXD COMP 36 OHM 1/8W 05%	651111-0360	RC05GF360J	81349
R16	RES FXD COMP 36 OHM 1/8W 05%	651111-0360	RC05GF360J	81349
R17	RES FXD COMP 36 OHM 1/8W 05%	651111-0360	RC05GF360J	81349
R18	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R19	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R20	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R21	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R22	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R23	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R24	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R25	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
R26	RES FXD COMP 10 K 1/8W 10%	651110-0103	RC05GF103K	81349
S5	SWITCH, PUSHBUTTON, 2PDT 4POS	553909-1250	F12.5042UGRB140101BA	00000
U1	IC CMOS BCD-7SEG LATCH/DECODE/DR	703MC14511BP	MC14511BCP	04713
U2	IC CMOS DEC CNTR 5STAGE JOH	703MC14017BP	MC14017BCP	04713

REV	DESCRIPTION	REQ NO	DATE	APP BY
A				
B	CHANGED: R1,2 VALUE; DIODE'S TYPE.	–	17623	11/1/01
C	DWG NO. WAS 07187702		4837	



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. RESISTORS ARE 1/8W, 5%, CARBON COMP.
2. DIODES ARE HP5082-4480.
3. U1-U9 ARE HP 5082-7653

LIST OF MATERIALS

AUSTRON AUSTIN, TEXAS

CODE IDENT 29672

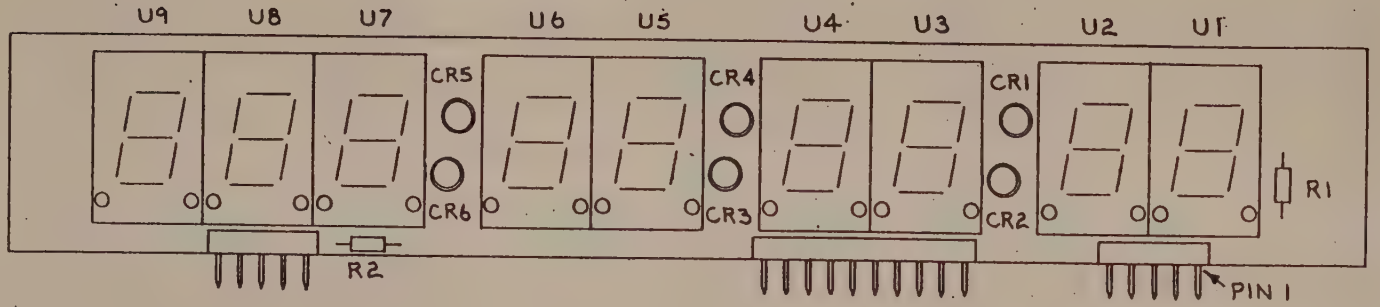
DISPLAY SCHEMATIC

DRAWING NO. 12307877-2 C

APPLICATION

5-28

REV	DESCRIPTION	ECN NO.	ECO NO.	DATE	APP BY
A	RELEASED TO RECORDS			1/6/78	
A1	CORRECTE ORIENTATION CR1-6	-	NFC	4/1/78	R
B	R1, R2 VALUE & DIODE'S TYPE CHANGED.	-	47623	3/9/78	L. Hill
C	DWG NO. WAS 07187702; ADDED 520821-0005 SHT. 2		4937 50M	3/14/78	R.R.B.



LIST OF MATERIALS

AUSTRON INC
AUSTIN, TEXAS

CODE IDENT 24472

ASSY DISPLAY BOARD

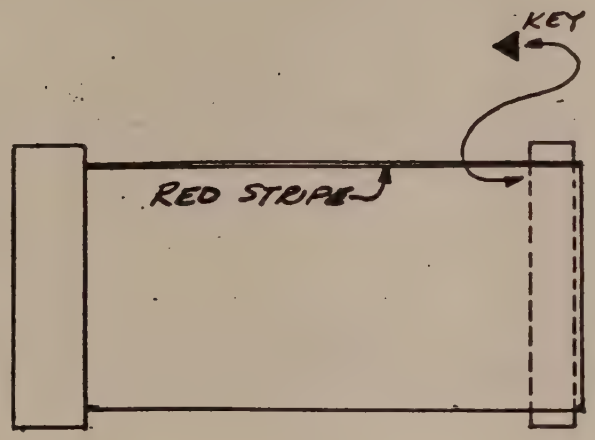
8720

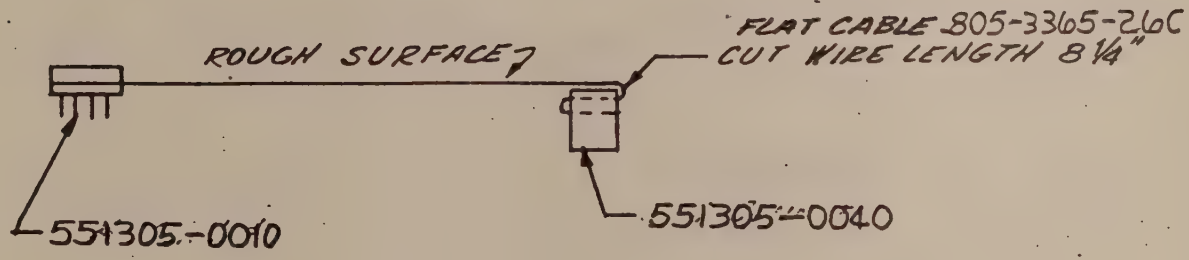
5-29

ASSEMBLY ASSY DISPLAY BOARD
ASSEMBLY NUMBER 10307877-2
REFERENCE DESIGNATOR PREFIX 1A3A3A1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
CR1	.12 LDS 20MA PC LED RED	555600-4480	HLMP-1000	2848
CR1MP1	1/8LX3/16 SPACER ROUND NYLON	520821-0005	9207N-115	06540
CR2	.12 LDS 20MA PC LED RED	555600-4480	HLMP-1000	2848
CR2MP1	1/8LX3/16 SPACER ROUND NYLON	520821-0005	9207N-115	06540
CR3	.12 LDS 20MA PC LED RED	555600-4480	HLMP-1000	2848
CR3MP1	1/8LX3/16 SPACER ROUND NYLON	520821-0005	9207N-115	06540
CR4	.12 LDS 20MA PC LED RED	555600-4480	HLMP-1000	2848
CR4MP1	1/8LX3/16 SPACER ROUND NYLON	520821-0005	9207N-115	06540
CR5	.12 LDS 20MA PC LED RED	555600-4480	HLMP-1000	2848
CR5MP1	1/8LX3/16 SPACER ROUND NYLON	520821-0005	9207N-115	06540
CR6	.12 LDS 20MA PC LED RED	555600-4480	HLMP-1000	2848
CR6MP1	1/8LX3/16 SPACER ROUND NYLON	520821-0005	9207N-115	06540
R1	RES FXD COMP 100 OHM 1/8W 10%	651110-0101	RC05GF101K	81349
R2	RES FXD COMP 100 OHM 1/8W 10%	651110-0101	RC05GF101K	81349
U1	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U2	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U3	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U4	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U5	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U6	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U7	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U8	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
U9	LED RED 7SEG COMMON CATH	555600-7653	5082-7653	28480
XA1/3	CONN 30 PIN RT ANGLE MALE	551009-0045	200264	16512

REVISIONS					
REV	DESCRIPTION	ENG. NO.	ECO NO.	DATE	APP. BY
A	RELEASED TO RECORDS			1/10/85	
A1	RED STRIPE ORIENT. CORRECTED	—	NFC	11/13/85	EJ
B	NO. WAS 07191101		4837	2/84	
C	REVISED PER ECO 6937 DLT		1	3/85	CBL





REFER TO DMPS 10
FOR ASSY PROCEDURE

ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

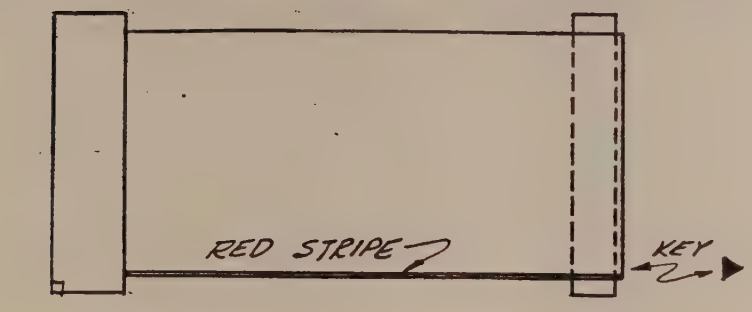
LIST OF MATERIALS

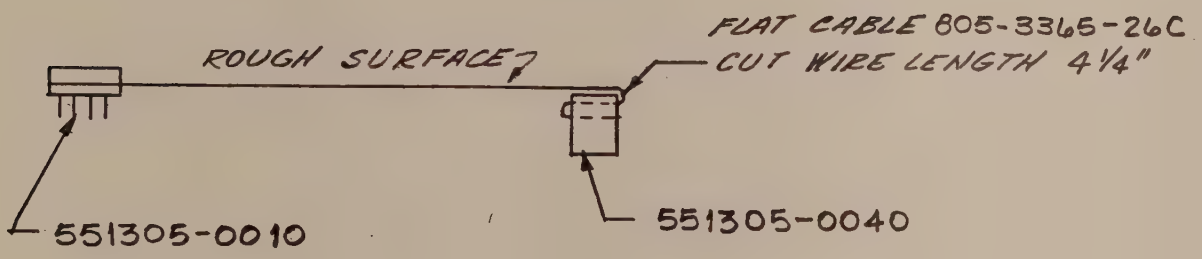
		DRAWN	DATE 3/4/85	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE X ±.1 XX ±.01 XXX ±.005 ANGLES ±	AUSTRON INC. AUSTIN, TEXAS
		CHECK	DATE		
		ELECT.	DATE		
		MECH	DATE		
		PROJECT	DATE		
8720	07191601	QA	DATE		CODE IDENT 24672
USED ON	NEXT ASSY	SCALE NONE	DO NOT SCALE DRAWING	SH 1 OF 1	MATERIAL 5-31
APPLICATION					

(A1P1) DISPLAY DRIVER CABLE ASSY

DRAWING NO.			
REF	SIZE	PART NO.	REV
	A	1150791I-1	C

REVISIONS					
REV	DESCRIPTION	PER. NO.	ECO NO.	DATE	APP. BY
	RELEASED TO RECORDS			1/10/85	
B	REPLACED 3M P/N'S WITH AUSTRON		4663	11/7	RDE
C	NO. WAS 07191102		4831	2/84	
D	REVISED PER ECO 6937			9/85	





ITEM NO.	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF. NO.

LIST OF MATERIALS

		DRAWN	DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X .XX .XXX ANGLES ±	AUSTRON INC. AUSTIN, TEXAS
		CHECK	DATE		
		ELECT.	DATE		
		MECH.	DATE		
		PROJECT	DATE		
8720	07190901	QA	DATE		CODE IDENT 24672
USED ON	NEXT ASSY	SCALE NONE	DO NOT SCALE DRAWING	SH 1 OF 1	MATERIAL 5-32
APPLICATION					

(A2P1) GENERATOR BOARD CABLE ASSY

DRAWING NO.			
REF	SIZE	PART NO.	REV
	A	11507911-2	D

6. STANDARD OPTIONS

6.1. SCOPE OF SECTION

Section Six provides circuit descriptions, logic and schematic diagrams, assembly drawings, and parts lists for the standard options included with your Model 8720.

6.2. OPTIONS INCLUDED

A number of standard options are available for the Model 8720. Standard options, when supplied with the instrument, are described on the following pages.

6.2.1. Coincidence Output, Option A17
(Schematic Dwg. No. 12307918-01)

General Description

The Coincidence Option adds front panel COIN LED CR2, COIN CLEAR switch S8, and a pole to DISPLAY/COIN switch S7. This option provides an output pulse (COIN M) and an output level (COIN L) at a preset time. The level signal lights the COIN LED. This level remains until cleared manually by pressing the CLEAR push button S8 or cleared remotely by grounding an external COIN CLEAR input. The preset limit is entered in seconds, minutes, hours and days (in separate groups) from the front panel PRESET thumbwheel switches (S2, S3 and S4). Enter the PRESET time by holding the DISPLAY/COIN switch in the COIN position and momentarily placing PRESET/RESET switch, S6, in PRESET. The coincidence output occurs once a day if 000 days are entered. The contents of the coincidence register can be displayed at any time by placing the DISPLAY/COIN switch in COIN.

Specifications

Outputs

A pulse and continuous level at a coincidence remains until cleared. Both outputs are positive level, DTL/TTL compatible signals via rear panel connector J1.

High = 5 Vdc ±5 Vdc at 1.2 mA
Low = 0 Vdc to +0.1 Vdc, 3.2 mA sink
COIN (M) momentary pulse(s) via (J102,44)
COIN (L) level via (J102,19)

Input

The $\overline{\text{COIN}}$ $\overline{\text{CLEAR}}$ input to (J102,21) is a ground true signal which clears the coincidence level output. Input may be DTL/TTL, CMOS or contact closure of 1 us or greater duration. The source must sink 0.6 mA.

Coincidence Limit Loading Procedure

Perform the following steps to load the coincidence limit.

1. Select the seconds (S00 through S59) on the front panel PRESET thumb wheel switches.

2. Hold the DISPLAY/COIN switch in COIN position and momentarily place the PRESET/RESET switch in PRESET.

3. The selected seconds appear in the display. In like manner, load minutes (M00 through M59), hours (H00 through H23), and days (000 through 365/366).

4. The selected times will appear in the display when loaded.

NOTE

If 000 days are entered, coincidence occurs once each day at the TOD selected. If any other days limit is selected, coincidence will occur once a year.

ASSEMBLY COINCIDENCE, A17 OPT.
ASSEMBLY NUMBER 12807914-1
REFERENCE DESIGNATOR PREFIX 1A1
QUANTITY EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
	***** ADD *****			
CR2	LED CLR DIFF .20D 50 MA	555600-4887	HLMP-0240	28480
S7	SW, TOGGLE DPDT ON-OFF-ON MIN	553304-0013	7205SYZQ	09353
S7MP1	NUT DRESS 1/4-40 NICK/PLATE	401000-0000	87099	09353
S8	SWITCH PSHBTN SPST-NO	553012-0005	39-3	81073
XCR2	LAMP HOLDER	555001-0003	0-084-3D	03797

ASSEMBLY OPTION (C11) IRIG-A OUTPUT
ASSEMBLY NUMBER 12807995-1
REFERENCE DESIGNATOR PREFIX 1A3
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
	***** DELETE ****			
A2C12	.01UF 50V 5 POLY-FOIL POTTEDRAD	604315-0103	719D1AA103PJ500AX	99392
A2C13	.01UF 50V 5 POLY-FOIL POTTEDRAD	604315-0103	719D1AA103PJ500AX	99392
A2W2	JUMPER			
A2W5	JUMPER			
	***** ADD *****			
A1W8	JUMPER			
A2C12	.001 UF 200V 10 CAP MYLAR	604192-0005	19210292	56289
A2C13	.001 UF 200V 10 CAP MYLAR	604192-0005	19210292	56289
A2W3	JUMPER			
A2W4	JUMPER			

ASSEMBLY OPTION (C18) NASA36 OUTPUT
ASSEMBLY NUMBER 12807994-1
REFERENCE DESIGNATOR PREFIX 1A3
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
	***** ADD *****			
A1W6	JUMPER			

ASSEMBLY OPTION (C26) XR3-250HZ OUTPUT
ASSEMBLY NUMBER 12807991-1
REFERENCE DESIGNATOR PREFIX 1A3
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
	***** DELETE ****			
A2C12	.01UF 50V 5 POLY-FOIL POTTEDRAD	604315-0103	719D1AA103PJ500AX	99392
A2C13	.01UF 50V 5 POLY-FOIL POTTEDRAD	604315-0103	719D1AA103PJ500AX	99392
A2W2	JUMPER			
A2W5	JUMPER			
A2W7	JUMPER			
	***** ADD *****			
A1W7	JUMPER			
A2C12	.039 UF CAP MYLAR	604192-0022	192P39392	56289
A2C13	.039 UF CAP MYLAR	604192-0022	192P39392	56289
A2W1	JUMPER			
A2W6	JUMPER			
A2W8	JUMPER			

ASSEMBLY OPTION (C26A) XR3-1KHZ OUTPUT
ASSEMBLY NUMBER 12807993-1
REFERENCE DESIGNATOR PREFIX 1A3
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
	***** DELETE ****			
A2W2	JUMPER			
A2W7	JUMPER			
	***** ADD *****			
A1W7	JUMPER			
A2W1	JUMPER			
A2W8	JUMPER			

ASSEMBLY OPTION (D15) // BCD OUTPUT
ASSEMBLY NUMBER 12807912-1
REFERENCE DESIGNATOR PREFIX 1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
A1U3	PERIPHERAL INTERFACE ADAPTER	703MC6821P	MC6821P	04713
A1U4	PERIPHERAL INTERFACE ADAPTER	703MC6821P	MC6821P	04713

6.2.2. Milliseconds Output, Option E14
(Schematic Dwg. No. 12308192-02)

General Description

Option E14 adds parallel BCD milliseconds outputs to the Model 8720 Time Code Generator. Milliseconds Output PCB A5 with rear panel connector J5 and associated wiring is added to the basic unit.

Specifications

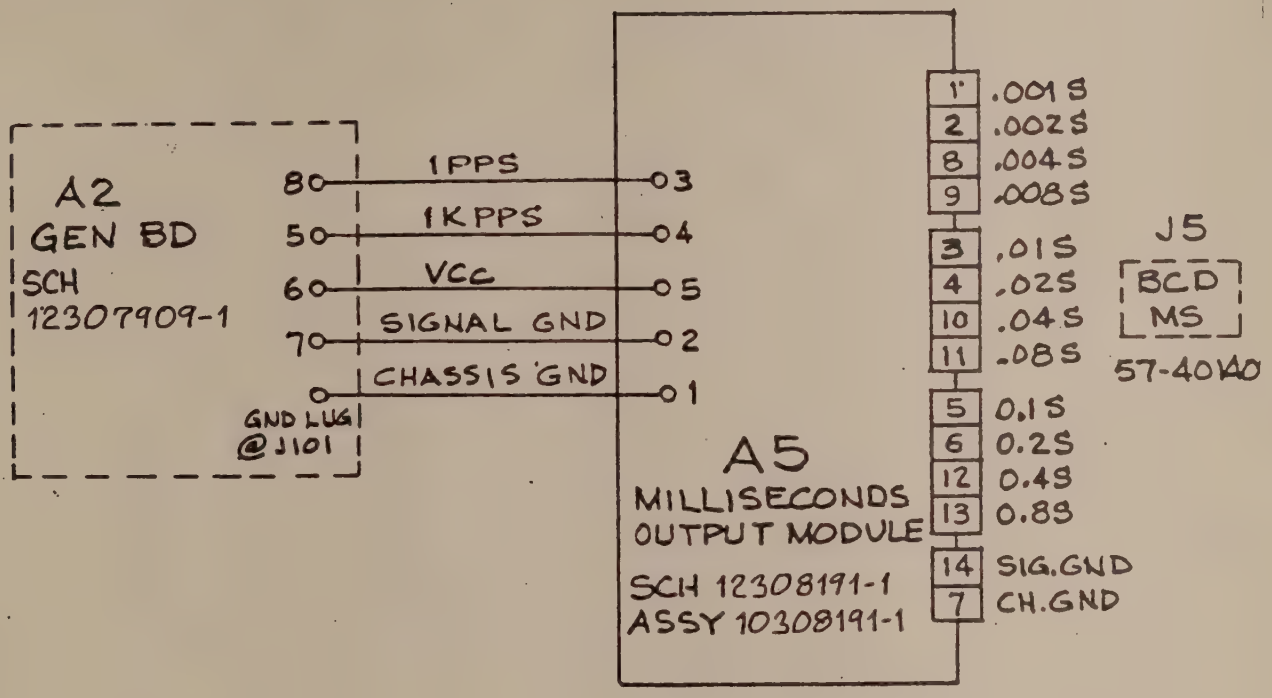
Three digits (twelve bits) of parallel BCD milliseconds are provided as outputs.

Code: 8-4-2-1

Logic: ONE = 2.4 Vdc to 3.2 Vdc at 200 uA

ZERO = 0 Vdc to 0.4 Vdc, 3.6 mA sink

A	RELEASED TO RECORDS			9/	KH
B	DWG NO. WAS 08119201		4837		
C	AUSTRON RELEASE		—	11/18/80	CRL



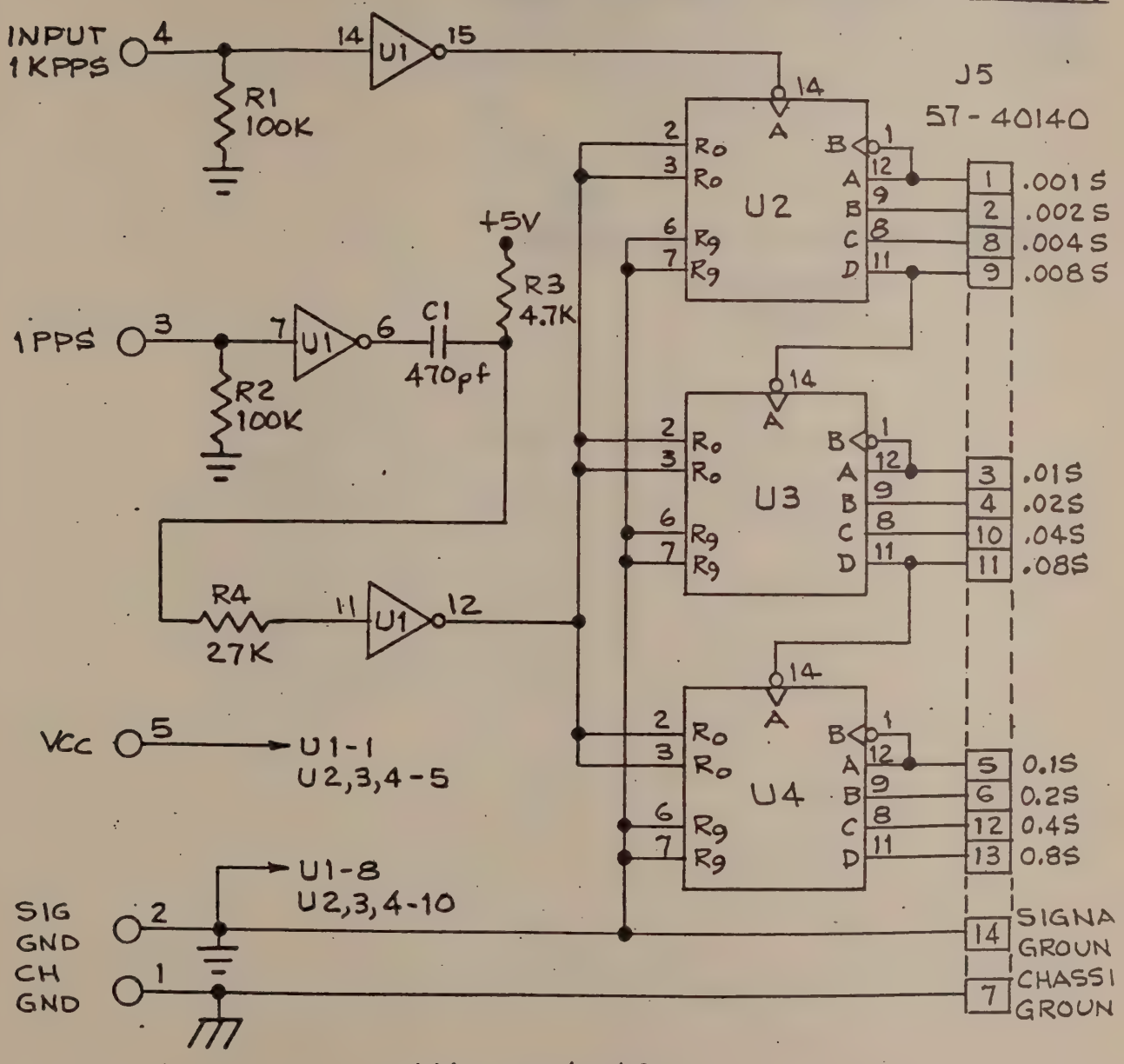
CIRCUITRY SHOW TO BE SUPERIMPOSED ON BASIC BLOCK DIAGRAM 12407918-1

		DRAWN		AUSTRON INC. AUSTIN, TEXAS	MILLISECONDS OUTPUT OPTION E14
		CHECK			
		ELECT.			
		MECH.	10/79	CODE IDENT. 24672	
8720-	E14	Q.A.		MATERIAL 6-11	SIZE 7
USED ON	NEXT ASSY	SCALE	DO NOT SCALE DRAWING	DWG SIZE	DWG NO 12308192-1 REV C
APPLICATION					

ASSEMBLY E14 OPT. ASSY, MILLISECONDS OUTPUT
ASSEMBLY NUMBER 12808192-4
REFERENCE DESIGNATOR PREFIX 1
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
	***** ADD *****			
A3A5	PCB ASSY, MILLISECONDS MODULE	10308191-1		24672
	** SHIP WITH **			
P5	CONN 14 PIN PLUG	551306-0000	57-30140	02660

REVISIONS				
REV	DESCRIPTION	NOT. NO.	ECO NO.	DATE
A	RELEASE TO RECORDS			9/79
A1	ADDED PINS 11 & 12 TO U1		NEC	10/79
A2	R3 WAS 56K. (ECR 132-79)	-	NEC	11-12-79
B	DWG NO. WAS 08119101		4837	
C	REVISED PER ECO 6804		6804	10-24-84

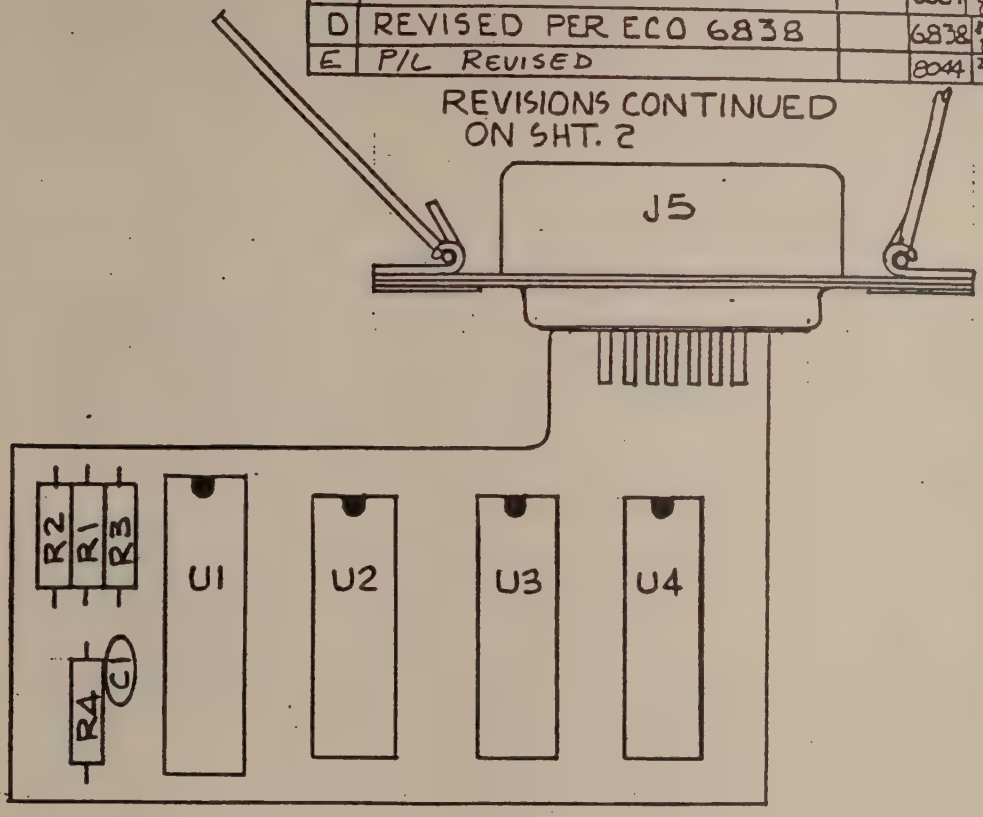


U1 = CD4049AE
U2, U3 & U4 = SN74HC90N

		DRAWN	DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.01 .XXX ±.005 ANGLES ±	AUSTRON INC. AUSTIN, TEXAS	MILLISECOND OUTPUT
		CHECK	DATE			
		ENGR.	DATE			
		MECH.	DATE			
8730		PROJ. MGR.	DATE		CODE IDENT. 24672	
8720		Q.A.	DATE			
USED ON	NEXT ASSY	SCALE —	DO NOT SCALE DRAWING	DWG SIZE A	MATERIAL 6-13	REF 7
APPLICATION				SHT 1 OF 1		DWG NO. 12308191-1 ISSUE C

REVISIONS				
LTR	DESCRIPTION	ENG. ORD.	ECO NO.	DATE
A	RELEASE TO RECORDS	—	.	10/6/77
A1	SHT. 2 : R3 (4.7K) WAS 5QK ● (ECR 172-79)		NFC	7/24/79
B	DWG NO. WAS 08119101		4837	
C	REVISED PER ECO 6804		6804	10-24-84
D	REVISED PER ECO 6838		6838	8-7-85
E	P/L REVISED		8044	2-13-86

REVISIONS CONTINUED ON SHT. 2



		DRAWN Ekel 7 DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE .X ±.01 .XXX ±.005 ANGLES ±	AUSTRON INC. AUSTIN, TEXAS	P.C. ASSY MILLISECOND MODULE
		CHECK DATE			
		ELECT. DATE			
		MECH. DATE			
8730	E14	PROJECT DATE		CODE IDENT. 21672	
8720	E14	Q.A. DATE			
USED ON	NEXT ASSY	SCALE 2:1	DO NOT SCALE DRAWING	DWG SIZE A	MATERIAL 6-14
APPLICATION				SH 1 OF 2	REF
					DWG NO. 10308191-1 REV E

ASSEMBLY PCB ASSY, MILLISECONDS MODULE
ASSEMBLY NUMBER 10308191-1
REFERENCE DESIGNATOR PREFIX 1A3A5
QUANTITY 1 EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
C1	CAP CERA RDL COG 470 PF 100V 5%	601110-0471	CN20A471J242	71590
J5	CONN 14 PIN SOCKET CHASSIS RCPT	551306-0005	57-40140	02660
R1	RES FXD COMP 100 K 1/4W 05%	651100-0104	RC07GF104J	81349
R2	RES FXD COMP 100 K 1/4W 05%	651100-0104	RC07GF104J	81349
R3	RES FXD COMP 4.7 K 1/4W 05%	651100-0472	RC07GF472J	81349
R4	RES FXD COMP 27 K 1/4W 05%	651100-0273	RC07GF273J	81349
U1	IC CMOS HEX INV/BUFF	703MC14049BP	MC14049UBCP	04713
U2	IC HSCMOS DECADE COUNTER	70374HC90N	MC74HC90N	04713
U3	IC HSCMOS DECADE COUNTER	70374HC90N	MC74HC90N	04713
U4	IC HSCMOS DECADE COUNTER	70374HC90N	MC74HC90N	04713

ASSEMBLY BATTERY OPT (L14) (PLIST)
ASSEMBLY NUMBER 12807913-1
REFERENCE DESIGNATOR PREFIX 1
QUANTITY EA

REF DES	PART DESCRIPTION	AUSTRON PART	MFG PART	FIC
	***** ADD *****			
A1CR1	LED CLR DIFF .20D 50 MA	555600-4887	HLMP-0240	28480
A1S7	SW, TOGGLE DPDT ON-OFF-ON MIN	553304-0013	7205SYZQ	09353
-MP1	NUT DRESS 1/4-40 NICK/PLATE	401000-0000	B7099	09353
A1XCR1	LAMP HOLDER	555001-0003	Q-084-3D	03797
A3BT1	BATTERY GEL/CELL 4V 2.6AH	570900-0028	GC426-1 TYPE A	25244
A3BT2	BATTERY GEL/CELL 4V 2.6AH	570900-0028	GC426-1 TYPE A	25244
A3MP1	SPACER, BATTERY	01507905		24672
A3MP2	COVER, BATTERY	00707907		24672
A3XP1	44RE TERM FEM TAPER RTANGL 20-16GA	520020-0014	60611-1	00779
A3XP2	44RE TERM FEM TAPER RTANGL 20-16GA	520020-0014	60611-1	00779
A3XP3	44RE TERM FEM TAPER RTANGL 20-16GA	520020-0014	60611-1	00779
A3XP4	44RE TERM FEM TAPER RTANGL 20-16GA	520020-0014	60611-1	00779

7. SPECIAL MODIFICATIONS

7.1. SCOPE OF SECTION

Section Seven provides circuit descriptions, logic and schematic diagrams, assembly drawings, and parts lists for any special or nonstandard options included in your Model 8720.

7.2. MODIFICATIONS INCLUDED

Modifications to the Model 8720, requested by the customer, are documented in this section. These are usually extra-cost items to tailor the unit for a specific application.

No special modifications are included in this unit.

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